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PROGRESSIVE MEDICINE.

A QUARTERLY DIGEST OF ADVANCES, DISCOVERIES, AND IMPROVEMENTS

IN THE

MEDICAL AND SURGICAL SCIENCES.

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PROGRESSIVE MEDICINE.

MARCH, 1903.

SURGERY OF THE HEAD, NECK AND CHEST.

BY CHARLES H. FRAZIER, M.D.

SKULL AND BRAIN.

Malformations. At the Thirty-first Congress of the Deutschen Gesellschaft für Chirurgie, Franke related his experience in an operation for the removal of a hæmatocele pericranii situated to the right of the vertex, in a girl, aged twenty years. The operation, which was attended with alarming hemorrhage, disclosed two defects of the cranial vault; these were closed by the application of a piece of silver filigree; this method fulfilled its purpose, and the process of repair was unattended with any inflammatory disturbances. As to the etiology, Franke is of the opinion that the cyst was a congenital varix, probably of the emissary veins, the development of which was favored by the presence of a congenital defect in the skull.

Lithgaw[1] records an operation for the removal of an encephalocele, carried out in a collier's house of one apartment, with no assistance save the chloroformist. The child, but twelve days old, despite the lack of facilities and assistance, survived the immediate effects of the operation. Healing took place by first intention, and all dressings were removed on the twelfth day. On the fourteenth day; when all danger was considered past, the child had some convulsive seizures and died.

Avulsion of the Scalp. But thirteen cases of avulsion of the entire scalp have been recorded, and some of these in an incomplete manner. To these one is added by Bivings,[2] the record of which is both interesting and unique, on account of the numerous complications and the absence of troublesome sequelæ.

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[1] British Medical Journal, July 18, 1902.

[2] Philadelphia Medical Journal, June 7, 1902.

The child's hair was caught in a pair of rapidly revolving steel rollers, resulting in complete avulsion of the scalp, together with the periosteum covering of both the parietal and a part of the occipital bones. The scalp was recovered after having passed through several sets of rollers. It was so lacerated that it was thought inadvisable to attempt to replace it.

In about two weeks from the time of the accident the outer table of the bones, denuded of their periosteum, began to necrose and eventually required complete removal. Following this the temperature rose to 105.3° F., and the patient became slightly delirious. Removal of the dressings failed to find anything to account for this elevation in temperature. Upon a physical examination of the chest it was found that the patient had developed a bilateral bronchopneumonia, from which she made a perfect recovery. Three skin-grafting operations were performed to cover the defect. The first was done by the Thiersch method, the second by a combination of the Krause and Reverdin method. The latter, however, was a failure; skin from the outside of several legs and from two frogs was used, with equally bad results. About the time another trial was to be made the patient developed an acute bilateral parotitis, followed by an acute membranous colitis. She recovered from both of these affections, however, and a third attempt, this time by the Thiersch method, was made to cover the remaining defect of the skin. This time the skin was taken from the patient's thighs, the pieces about one inch wide and three inches long. In two weeks' time the head was entirely covered with skin.

The author makes the observation that in his opinion the Thiersch method is very much superior to any other, and that skin grafts taken from the body of the patient grow far better than grafts from the skin of other people.

Cerebral Pressure. A very exhaustive work on concussion and cerebral pressure has recently been published by T. Kocher, in *Nothnagel's Specielle Pathologie und Therapie* (Band ix., Theil iii., Abth. 1), representing the results of a series of experiments carried out under the direction of Kocher, by his students, A. Kocher, Maasland, Saltikoff, Cushing, and others. The work begins with an introductory chapter upon the anatomy and physiology, and concludes with one on the surgery of the brain; but the portion of the work which, by virtue of its originality, commands the most attention is that devoted to the subject of general intracranial compression.

On the basis of this experimental and clinical experience, Kocher regards neither of the two theories—namely, the one which attributes the symptoms to a cerebral anæmia, the other to venous stasis—as solely accountable for the symptom complex of cerebral compression (Hirndruck), but is inclined to believe that the lesion will be found to vary according to the clinical stage. Thus, he recognizes three distinct stages : (1) The initial stage, in which there is a condition of dysdiamyrrhosis, an obstruction to the venous outflow of blood ; (2) the intermediate stage of intermittent adiamyrrhosis, in which the compression of the vessels is so great that the brain becomes anæmic, at first intermittently, until (3) the final stage of continuous adiamyrrhosis. According to Cushing,[1] general compression was produced experimentally by allowing a normal saline solution to enter the cerebrospinal space through a canula screwed into one part or another of the skull or in the lamina of one of the vertebræ. The tension under which it stood was regulated by the degree of elevation of the flask, and this was recorded at the same time on a revolving drum by the insertion of a mercury manometer in the course of the tube in exactly the same way as the arterial pressure was recorded. The vascular alterations, observed through a glass window introduced into the vault of the skull, consisted primarily of venous stasis, with widening of the venous radicals, of a marked color differentiation between the smaller arteries and veins, and of an exophthalmos from a retrobulbous œdema. As the pressure is increased the longitudinal sinus wavers, narrows, and thins until it is completely collapsed. The pressure of the fluid against the brain may be increased to the point at which it equals that of the blood pressure before any symptoms referable to disturbance of the centres in the medulla make themselves manifest. In the initial stage there are no essential symptoms of cerebral pressure, since, in spite of compression, the veins are able to carry off sufficient blood to prevent disturbance of nutrition. Clinically, there may be a choked disk and some mental torpor or apathy. The former should be regarded as a very valuable diagnostic sign in the recognition of the early stage of cerebral pressure, since it appears before none or only the questionable signs are present. It is present as long as there is any cerebro-spinal fluid within the cranial cavity ; once this is altogether pressed out the choked disk disappears. It may be regarded, therefore, not only as a valuable diagnostic sign, but a favorable prognostic one. When the condition of dysdiamyrrhosis of the capillaries becomes more pronounced—that is, when the veins have not sufficient calibre to carry off the blood—the phenomena of cerebral irritation, headache, vertigo, restlessness, delirium, tinnitus, etc. (the so-called stage of stimulated function), first make their appearance. The headache, signs of restlessness, irregularity in breathing were ascribed by Maasland and Saltikoff to pressure on the fibres of the trigeminus in the dura.

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[1] The American Journal of the Medical Sciences, October, 1902.

2. Once the intracranial pressure equals that of the blood pressure there is seen on inspection of the cortex an abrupt change from one of hyperæmia to one of anæmia. The color of the convolutions changes from a rosy to that of a grayish-yellow hue. The result of this sudden production of anæmia of the brain is at first not death, but a compensatory stimulation of the vasomotor centres, which, acting through the peripheral vessels (since there are no vasomotor nerves in the brain) cause such an increase in the arterial pressure as will compensate for the increased intracranial tension. The circulation of the brain will be re-established. As the intracranial pressure is increased anæmia or adiamyrrhosis again develops until there is a compensatory rise in the blood pressure. Thus, for a time at least, we have a condition of adiamyrrhosis alternating with dysdiamyrrhosis or what was referred to as the intermediate stage.

3. The third or final stage, that of continuous cerebral anæmia, would soon terminate fatally were it not that the anæmia itself acted as an irritant to the vasomotor centre in the medulla sufficiently to cause for a certain time the compensatory increase in the blood pressure.

When adiamyrrhosis or cerebral anæmia is once established there follow the symptoms which complete the picture of cerebral compression—*i. e.*, the coma, irregularity of the respiratory act, often of the Cheyne-Stokes type, and the pulse, at first slow, full, and bounding, becoming immediately before death small and irregular. Unless some relief to the intracranial tension will be afforded, a vasomotor breakdown ensues, the vasomotor centre ceases to respond, loses its effect upon the great splanchnic area, the blood pressure finally falls below that of the intracranial tension, the respiratory and cardiac centres in the medulla are no longer properly nourished, and the individual dies with a low blood pressure and rapid heart, preceded by an arrest of respiration.

In connection with two cases of trauma to the head in which there were symptoms of compression, due not to depression of the skull, but to intradural hemorrhage, Tillman[1] conducted a series of experiments for the purpose of explaining why in these cases elevation of the head was followed by marked increase in the symptoms of compression and lowering the head was followed by an improvement in the condition. He submitted to research for the elucidation of the problem two questions: 1. How much diminution of space must there be before symptoms of compression develop? 2. Is it possible and conceivable that a change in the position of the head may alter the pressure of the blood effused inside the skull, and that the sensorium unaffected while the horizontal position is maintained may be involved as soon as the upright position is assumed? The experiments consisted essentially in injecting into a rubber bag which had been inserted in the epidural space, fluids of various specific gravities, varying the position of the head and noting the results. He estimated the exact amount of fluid that could be injected—*i. e.*, the degree to which the intracranial space could be diminished before symptoms of pressure were produced. This amount of fluid was then injected, and changing the position from one of elevation to one of dependency, it was observed first that when the head was elevated the heavier the fluid the less was required to produce symptoms, proving that the symptoms were due wholly to the pressure exerted by virtue of the weight of the fluid, and secondly, that when the head was lowered the fluid acted not with reference to its specific gravity, but merely by diminishing the intracranial space. If an analogy can be drawn from the experiments, it would seem that a blood clot, which is of greater specific gravity than either brain tissue or blood, lying in the cortex acts not only by diminishing the intracranial space, but by the pressure exerted by its weight; that, therefore, a small clot in the base may give rise to no symptoms, while a clot of similar weight in the cortex may cause severe symptoms. If the blood clot, by virtue of its weight, plays a part in evoking symptoms of compression we would expect that there would be some difference between the clinical pictures of an epidural or subdural; in the case of the epidural hemorrhage the clot could be so separated by the dura that it would not act directly on the brain below, the blood acting merely by diminishing the intracranial space. If, on the other hand, an hæmatoma forms beneath the dura, symptoms of pressure will appear almost simultaneously with those of general pressure.

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[1] Archiv f. klin. Chirurgie, vol. lxiv.

Jackson,[1] of the United States Volunteer Service, was called upon to treat a patient who had been struck with an iron bar in the left frontal and right occipito-parietal regions. Though the patient complained of persistent headache, there were no other evidences of intracranial injury until the eighth day, when he became unconscious and had convulsive seizures, general in character, resembling epilepsy. The frequent occurrence in the succeeding hours of these convulsions led the surgeon to operate, with the view of relieving intracranial pressure. A button of bone was removed from the left frontal region, the site of the contusion; the dura, which was evidently under pressure, was incised and about 15 c.c. of clear fluid escaped. The convulsions occurred with still greater frequency, and the skull was opened again, this time in the right occipito-parietal region, upon which point the patient had been struck, and again evidences of a subdural effusion were discovered; the dura was incised and about 45 c.c. of a sanguineous fluid escaped. From that time on the convulsions ceased, and the patient's recovery was an uneventful one.

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[1] Philadelphia Medical Journal, May 3, 1902.

Cerebral Hemorrhage. Secondary cerebral hemorrhages, that is, hemorrhages subsequent to but not immediately following a head injury (spät blutungen) demand consideration not only because of the difficulties attached to their diagnosis, but because of their important bearing upon medico-legal questions. The hemorrhages referred to by Matthes[1] in his treatise upon this subject are not those which make themselves manifest almost immediately after the injury and follow direct violence, but those which there is reason to believe do not occur until days, weeks, or even months after the injury and usually follow indirect violence. The force inflicting the injury is not sufficient to cause any demonstrable or, perhaps, only an insignificant injury to the skull, such as would be productive rather of concussion of the cerebral tissues at or diametrically opposite the point of impact—*e. g.*, a blow upon the head with the fist, a slap on the ears, a blow with a blunt instrument, or the knocking of one's head against some obstructive object.

Such injuries cause contusions and hemorrhages of varying extent to the cortex, either at the point of contact or upon a point diametrically opposite, or in the lateral ventricle, and, as a result, there follows immediately certain localized circulatory disturbances, leading to œdema of the surrounding tissue, and later, perhaps, to degeneration and necrosis. This softening of the brain tissues lessens the support normally afforded the vessel walls, and the traumatic reaction increases the blood pressure; these two forces co-operate in disturbing the relationship of the internal and external pressure, and so increase the demands made upon the resistance of the vessel wall. It is not improbable that, as a result of the injury, the arterial coats undergo fatty degeneration, and this increases the liability to rupture. The combined operation of these two factors, associated, perhaps, with such an increase in the general arterial pressure as would attend emotional excitement, overeating or drinking, straining, crying or laughing, will lead to secondary hemorrhages in the brain. The clinical picture of these so-called traumatic apoplexies corresponds to that observed in hemorrhage of other sources, but in order to confirm the diagnosis one must take into consideration also the character and force of the injury, its immediate consequences, and the time intervening between the injury and the apoplectic seizure. The degree of violence, as well as individual predisposition, so far as concerns the condition of the brain tissue and its vessels, the point of contact, and the direction in which the force was applied, are all factors which will assist materially in determining the seat as well as the nature of the lesion. There may have been no symptoms pointing directly to any cranial disturbance—*e. g.*, loss of consciousness, manifested at the time the injury was inflicted; days, weeks, or even months may have elapsed. The longer the apoplectic attack is deferred the more difficult is it to recognize the connection between it and the injury, and one is justified in attributing it to pre-existing trauma, only when other factors which play a rôle in the causation of apoplexy in adult age have been excluded, or when, by virtue of their age and freedom from disease, the question of atheroma of the peripheral arteries would be out of the question. Should the patient die, the diagnosis may be confirmed by the discovery of certain lesions, particularly small punctiform hemorrhages, at the site of predilection for such injuries, especially in the neighborhood of the ventricles.

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[1] Sammlung klin. Vorträge, No. 322.

The connection between these secondary hemorrhages and previous injury is difficult to discover, because it is difficult to prove that the degenerative changes in the vessel walls were of traumatic origin; at best the establishment of any relationship of cause and effect between these two conditions must be more or less a matter of conjecture. One must bear in mind the many chronic affections, such as syphilis, alcoholism, lead poisoning, and nephritis, which of themselves lead to arterio-sclerosis, and only in the absence of any plausible reason can the traumatic origin of the lesion come into consideration. If it were possible to prove the existence, prior to the injury, of symptoms pointing to degeneration of the vessels of the central nervous system, such as headache, tinnitus aurium, muscæ volitantes, vertigo, and the like, we would have at our command evidence in favor of the non-traumatic as opposed to the traumatic origin of the hemorrhage. But the question might then arise as to whether the injury did not aggravate the pre-existing pathological condition of the vessels by reducing their vitality and resistance.

That injuries to the head are occasionally followed by aneurismal formation has been proved by many observers; should the aneurism rupture, the resulting cerebral hemorrhage could with propriety be attributed to the effect of an injury. Furthermore, an aneurism might have developed from causes other than trauma, but its rupture might be precipitated as a direct result of an injury to the head.

The diagnosis of *hemorrhage* from the *middle meningeal artery* can be frequently made without much difficulty, providing there are no other associated lesions to mask the symptoms. But it is rarely possible to determine whether the hemorrhage is due to rupture of the trunk, of its anterior or posterior branch. The general indications for treatment are, however, the same, namely, the evacuation of the clot, and, if necessary, the ligation of the injured vessel, save that in hemorrhage from the anterior branch the skull is trephined at the anterior inferior angle of the parietal bone, and in hemorrhage from the posterior branch, one inch below the parietal eminence.

Plummer[1] advocates the use of the Hartley-Krause flap in the treatment of hemorrhage from the middle meningeal artery, and reports two cases in which he carried out this plan. He regards the osteoplastic flap as the best method of reaching the middle meningeal artery, for by it the removal of the clot and the ligation of the artery at the most desirable location are facilitated. Krause, in his original article, made a note to the effect that his incision would serve well for the purpose of ligating the main trunk of the vessel, but inasmuch as the great majority of hæmatomata can be reached by trephining at the anterior inferior angle of the parietal bone, a more extensive resection, such as that of the Hartley-Krause method, should not be employed until by the simpler procedure the clot cannot be evacuated nor the hemorrhage controlled.

Hotchkiss[2] reports a case which furnishes a typical example of complete *motor aphasia* due to a small cortical hemorrhage in the region of Broca's convolution, and illustrates in a very striking manner the results of indirect violence in the production of a cerebral injury. The patient had fallen backward down stairs, striking, presumably, upon the back of his head. After recovering consciousness he had great difficulty in talking, and soon was unable to utter a single word. The motor aphasia together with the right facial palsy pointed clearly to pressure over the region of Broca. This was explored under ether anæsthesia, and a small subdural clot discovered and evacuated. Within eleven days the power of speech was almost fully restored.

Among the *cerebral complications of whooping-cough* is cerebral hemorrhage, a complication which may require surgical attention. Up to the present time, as far as we know, only one case has actually been treated by surgical measures, and now Noevy[3] reports a case of similar nature, which was referred to the surgical wards of Professor Hahn in the Frederichshain Hospital.

In the course of the attack the child had a convulsion, and later in the day developed a complete hemiplegia. On the following day she lost consciousness. Under chloroform narcosis lumbar puncture was practised, and about two centimetres of fluid, free from bacteria or any evidences of inflammation, evacuated. There followed an amelioration of the condition, with gradual restoration of consciousness and disappearance of the motor disturbance.

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[1] Annals of Surgery, vol. xxxvi., No. 4.

[2] Ibid., No. 1.

[3] Deutsche Zeitschrift f. Chirurgie, Band lxv., Heft 2-4.

Referring to the duties of the surgeon, with reference to the treatment of this complication of whooping-cough, Noevy writes that when the signs point to a localized hemorrhage, either epidural or subdural, it is well to wait, unless there is decided evidence of pressure, and the patient is growing rapidly worse, because the symptoms of a circumscribed hemorrhage may be caused by capillary hemorrhage into the brain or by simple œdema. If, on the other hand, the intracranial pressure becomes alarming in a comparatively short time, the indications for trephining are absolute and well defined. The more advanced the disease the less probable the necessity for operative intervention.

Noevy says that in every case lumbar puncture should be employed not only as a diagnostic measure, but for its therapeutic effect in reducing the intracranial pressure.

Lumbar Puncture. In PROGRESSIVE MEDICINE for March, 1901, there is a reference to Tuffier's suggestion of the employment of lumbar puncture as an aid to the diagnosis of fractures of the skull. Bochard[1] adopted this measure and found that the escape of but a small amount of cerebro-spinal fluid aroused his patients from their stupor and hastened recovery. As a means, therefore, of relieving tension, and thereby favoring recovery, Bochard recognizes the value of lumbar puncture, but as a means of diagnosis he believes it has no significance, since often even in slight contusions or slight concussions, blood may be found in the cerebro-spinal fluid. He cites the following cases :

CASE I.—A child sustained a blow on the head and was brought to the hospital comatose, with limbs relaxed and eyes open and fixed. Lumbar puncture was performed to ascertain the presence of blood in the cerebro-spinal fluid. Immediately the child was aroused and released himself from the nurse who was holding him. Only 3 c.c. of the cerebro-spinal fluid were withdrawn.

CASE II.—A man fell backward down stairs. The diagnosis lay between meningitis, contusion of the brain, and fracture of the base of the skull. Lumbar puncture yielded a fluid which escaped in jets from the canula and which was deeply stained with blood. The high tension of the fluid suggested compression of the nerve centres. Between 30 and 40 c.c. were withdrawn. In the evening he awoke from his torpor, recognized his surroundings and replied readily to questions. Vomiting ceased and headache became less severe. In eleven days he was so well that he wished to leave the hospital.

Besides the cases in which lumbar puncture may be employed to obviate the ill-effects of increased intracranial pressure there are others, resulting from severe injuries to the head, in which it does much good. There are cases of chronic *meningo-encephalitis* in which mental symptoms and headache are prominent. The headache is usually violent and obstinate, resisting all treatment and rendering the patient's life unbearable. The writer has seen it cured completely by lumbar punctures repeated more or less frequently, as occasion required.

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[1] Presse Médicale, April 5, 1902.

CASE III.—An electrician received a violent electric shock and fell from a height of about twenty-six feet. He was brought to the hospital in a state of coma, with every symptom of a fracture of the vault of the skull radiating to the base. There were ecchymoses behind the mastoid processes and under the conjunctivæ, and bulging of the parietal bones. After two days he recovered consciousness, but had severe pains in the head. Eighteen c.c. of red-stained cerebro-spinal fluid were withdrawn by lumbar puncture, and in a few minutes he felt so much relieved that he asked why it had not been done before. About eight hours after the first puncture the headache returned. Next day the operation was repeated. When 10 c.c. of fluid had been withdrawn the headache was much better. In all 16 c.c. were removed, and this produced slight nausea and some deafness. After the operation the patient slept for some hours, and on awakening found that his headache had been relieved.

CASE IV.—A mason, aged fifty years, fell from the second story of a house and fractured his skull at the base. He was brought to the hospital in a state of coma. Lumbar puncture was at once performed, and he began to recover consciousness. But he complained of headache, which prevented sleep. A second puncture, withdrawing 8 c.c. of cerebro-spinal fluid, eased him a little. Nine days after the accident a third puncture was made, and 30 c.c. were withdrawn. This caused the pain to disappear almost entirely from the frontal region, but did not relieve it at all in the occiput. A week later 42 c.c. were withdrawn, and the patient felt distinct relief. For about a day the head did not ache; then the pain returned. A fifth puncture was made and 4 c.c. of fluid were withdrawn. The centrifuge showed that the fluid did not contain blood. Three more punctures were made at the request of the patient, and since then the headaches disappeared completely.

The writer believes that in these cases lumbar puncture served not only to cure the headaches, but also promoted the prompt return of the mental faculties by favoring absorption of effused blood. A similar case is reported by M. Schwartz. A man with a fracture of the base of the skull had severe headache eight days after the accident; 25 c.c. of cerebro-spinal fluid were withdrawn by lumbar puncture. In four hours all pain had disappeared and did not return. Poirier has seen headaches greatly relieved by lumbar puncture, the patients complaining only of slight heaviness of the head. Marie and Le Guillian have tried lumbar puncture with success in headaches of syphilitic origin.

Location of Foreign Bodies in the Brain. With the aid of radioscopy, Stamm[1] determines the seat of foreign bodies on the principle of geographical location by parallels of latitude and longitude. Into a narrow flexible strip of sheet metal perforated at distances of 1 cm. small nails are inserted, the points projecting outward, the heads held in place with wax. The strip, secured in place by a gauze bandage, runs from the root of the nose to the level of the base posteriorly. One radiograph is taken, and, after removing and re-applying the strip in a transverse position, a second exposure is made. After each exposure the position of the foreign body is marked upon the skull, and its position with relation to the number of the nearest nail noted.

Brain Tumors. The advances that have been made in the surgery of tumors of the brain have been the result, first, of more accurate methods of localization, among which should be mentioned the use of the Röntgen ray, and, secondly, of improvements in operative technique, chief among which are the control of hemorrhage by temporary closure of the carotid arteries and osteoplastic resection of the skull by the Stellwagen trephine. Mills, who has had such a wide and varied experience with cases of brain tumors, and who has done so much to open the way for a brighter future in the field of surgery, has recently expressed his views in the following words:[2]

"I believe that we are getting on surer ground with regard both to the diagnosis and the operative treatment of cases of tumor of the brain. In addition to our increased knowledge regarding the localization of cerebral functions, this and the former case reported by me, as well as the case of Church,[3] show that the Röntgen ray method has a practical place in the diagnosis of intracranial neoplasms. I am satisfied, as I have said in previous papers, that the gravest dangers to life in operation for brain tumors are from hemorrhage and prolonged operation. Lack of success in removing tumors is also due largely to the fact that the operations are rarely performed at as early a date as they should be, and that the trephine openings are usually too small. I conclude, therefore: (1) As soon as a brain tumor is clearly diagnosed, if presumably it is in an accessible area, operation should at once be performed; (2) that a Röntgen ray investigation should be added to the other methods of making a diagnosis; (3) that large openings in the skull should always be made; (4) that the operation should be osteoplastic in order not to leave a permanent opening in the skull and to add to the chances of maintaining the vitality of the bone flaps; (5) that preparation should always be made to perform a Crile operation for temporary clamping of the carotids as soon as hemorrhage becomes threatening; and (6) that the operation in some cases should be done in two stages, the propriety of this procedure being determined by the circumstances attending the first operation."

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[1] Centralblatt f. Chirurgie, March 22, 1901.

[2] Philadelphia Medical Journal, September 27, 1902, p. 441.

[3] American Journal of the Medical Sciences, February, 1899, n. s., vol. cxvii.

The sixth and last of these suggestions is, I am convinced, deserving of very serious consideration, and for the following reasons:[1] Probably 25 per cent. would be considered a conservative estimate of patients who die immediately from the effects of operation. In some cases death is attributed to shock, in some to concussion, and in some to "unknown" causes. I am inclined to believe that in the latter class of cases death is due to the sudden withdrawal of intracranial pressure. It is well known that the brain can be subjected to a certain amount of intracranial pressure without any serious consequences; it is furthermore known that there is a rise in the blood pressure compensatory in character, compensating for the disturbance to the cerebral circulation consequent upon the increased pressure. Recent investigations of Kocher and his students have demonstrated that the sudden withdrawal of intracranial pressure, after the blood pressure has been forced to a considerable height, may be followed by paralysis or breakdown of the vasomotor mechanism, resulting in death.

If we are right in assuming that this theory will explain many of the fatal terminations in a given number of cases, should we not give more serious consideration to that modification in the technique of operation on brain tumors which calls for the division of the operation into two stages? Horsley recommended the adoption of this procedure in every case without exception, and von Bergmann, though not going so far as Horsley, recommended the two-stage operation in cases in which the patient's general condition was below par, or in which the tumor was a particularly large one; but surgeons at large do not approve of, or, at any rate, do not practise, Horsley's method. I believe, however, that it is deserving of more serious consideration, and should be practised for a length of time and upon a number of cases sufficient to determine its effect upon the mortality. While neurologists have encouraged their surgical colleagues to introduce into their technique every time-saving and blood-sparing measure, with the hope of making the statistics of the future more encouraging, they have not laid sufficient stress upon the importance of presenting the case to the surgeon at the earliest possible moment—weeks and months have been spent in the fruitless administration of iodide of potassium before the question of operation has even been considered, and in many cases an unwarranted amount of time is spent in studying the case, with a view toward confirming the diagnosis, but more particularly toward determining the seat of the tumor. On the other hand, the surgeon must come in for his share of criticism for the lack of interest and the lack of knowledge he exhibits in the neurological aspects of the case. In order that the very best results be obtained the surgeon and the neurologist must work hand-in-hand; the former should be fully cognizant of the methods of localization and with the symptomatology of cerebral tumors; the latter fully aware of the conditions that give the greatest promise of operative success. There will, of course, be cases which will be sources of keen disappointment, cases in which the tumor cannot be recognized or found at the operation; cases in which the tumor is not accessible, such as tumors at the base of the brain, or tumors of the cerebellum; cases in which the tumor on account of its infiltrating character cannot be successfully or completely removed.

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[1] Frazier. Discussion on the subject of brain tumors at the October, 1902, meeting of the College of Physicians of Philadelphia.

Attention has already been called to the necessity of making free exposure of the brain surface and of the advantage of the osteoplastic operation over the trephine or chisel.

OSTEOPLASTIC RESECTION OF THE SKULL. Objections may readily be found for all of the methods hitherto known in operations for the removal of large sections of the skull. Those methods in which the bone flap is cut by chisels or gouges are unquestionably attended with a degree of traumatism that must be injurious to the nervous structures within the skull, and it is the belief of some surgeons that the hammer increases the shock and distinctly adds to the risk of the operation. The introduction into our surgical armamentarium of the Gigli saw was welcomed in that it did away with the objections attending the use of the chisel and mallet; but this method is not ideal, since it requires the expenditure of a great deal of time. A third method which has recently come into vogue has been the use of the so-called dental surgical engine, to which is attached a saw specially constructed for osteoplastic work on the skull. Objections are offered to this instrument on the ground that it requires long training and utmost care in manipulation of the instrument and that the engine is difficult to sterilize. Da Costa,[1] in reference to this, described a new instrument for osteoplastic resection of the skull, which was devised by a student of the third-year class of the Jefferson Medical College. The instrument consists of a handle and a shaft, as does an ordinary trephine. Screwing into the end of the shaft is a movable centre-pivot or point, instead of the pin seen in the ordinary trephine. Stellwagen and Da Costa discovered, while working on a dead body, that a sharp and long centre-point might bore through a thin skull. The danger of such a puncture is reduced to a minimum by placing a shoulder above the point, which shoulder prevents the possibility of any deep penetration. Another method is the use of a centre-plate with a hole for the pivot, and with sharp points on the under side, these points being driven through the scalp and a short distance into the skull, thus assuring fixation.

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[1] Annals of Surgery, July, 1902.

Plates containing points of several sizes should be used, the thickness of the scalp determining to some extent the length of point which it is necessary to employ. If care is taken that sufficient length is used to go but a short distance through the scalp, there is no real danger of penetrating the skull with the point.

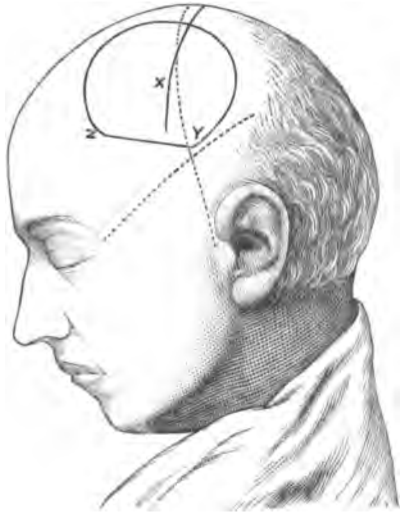
The centre-pivot, too, may be changed, a short or a long one being used as desired. Stellwagen says that when using the centre-pivot without the plate it has been found practicable upon the cadaver to start it with an appropriate drill, sinking the hole just deep enough to prevent slipping of the instrument. Thus, a centre-pivot with a blunt end may be used for the final work.

From his experience with the instrument upon the cadaver and on the living subject, Da Costa is of the opinion that this method of resecting the skull is superior to all others hitherto in vogue. The instrument is commended for its simplicity of construction, the ease with which it can be manipulated and sterilized, its freedom from danger of disarrangement or crippling, the speed with which it can be set up, or sharpened if need be, its adaptability to various cases, its cheapness, and the fact that either an osteoplastic flap or a circular piece can be rapidly cut by it.

When a tumor has been accurately localized the operation may be a failure because sufficient care was not taken to map out the cranial area previous to the operation. A mistake of less than an inch in locating the antero-posterior position of the central fissure, or the height of the horizontal branch of the Sylvian fissure, may, Mills says, add considerably to the uncertainties and difficulties in an attempt at the removal of the tumor by making an opening so as only partially to include the neoplasm. The following is Mills' method:

"My own method of procedure in a case of operation for brain tumor is, whenever possible, not only to locate the position of the tumor, but also exactly to fix the limits and direction of the osteoplastic flap which it seems most desirable to make. In the present contribution I shall illustrate this by only one example. If the intention is to remove a tumor accurately limited to the motor region, as in the case the history of which is appended to this paper, the central fissure and horizontal branch of the Sylvian fissure should first be indicated on the shaven scalp; then the area supposed to include the underlying tumor should be exactly mapped out; and, finally, the base-line of the flap which the surgeon is to make should also be indicated. The illustration (Fig. 1) shows exactly the method of carrying out these directions. The squamosal line, which corresponds fairly well to the Sylvian fissure, and the line of the central fissure having been determined by the Anderson-Makins method, the spot for the insertion of the pin of the Stellwagen trephine is next determined. As the arm of this trephine can be extended so as to give a radius of nearly two inches, the point selected for the pin should be about one-half inch in front of the central fissure at about its middle or a very little below this point. It is now generally believed that the motor region is largely in front of the central fissure, and the circle outlined by the arm of the trephine when the pin is placed in the position just stated would be such as to include a little more than the motor region forward and backward, while it would nearly uncover it toward the median line and also in the direction of the Sylvian fossa. The Anderson-Makins lines and the circle can readily be marked on the scalp with a tape-line, compasses, and an aniline pencil. The base-line should be about one and one-half inches in length, and should so bisect the lower portion of the circle as to cross the line of the central fissure at its lower extremity and at right angles to it. In the illustration (Fig. 1) the position for the pin of the trephine is indicated at *x*, while the base-

Fig. 1.

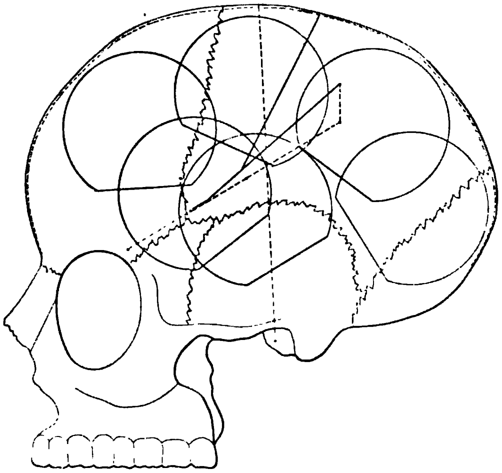


Photograph of the motor region outlined on the skull previous to osteoplastic operation with the Stellwagen trephine; *x*, point to the insertion of the pin of the Stellwagen trephine; *y*, *z*, base-line.

line extends from y to z. When these points have been determined by careful measurements, the scalp can be marked by small incisions at x, y and z. At the time of operation it is then only necessary for the pin to be inserted in the proper position in the scalp and for the knife to be inserted at one end of the base-line and swept around the circle until it reaches the other end. No time is then lost in determining the direction and length of this line. The aniline markings can, of course, be removed when these positions have been determined, as will be necessary in order to complete the sterilization of the scalp before operation."

The most desirable positions for the osteoplastic operation are on the lateral aspect of the skull above the line of the tentorium—*i. e.*, the prefrontal, the motor, the parietal, the occipital, the occipito-temporal, parieto-temporal, or temporal regions. The accompanying illustration (Fig. 2), taken from Mills, shows the most desirable position for six osteoplastic resections designed to uncover six of the physiological regions in which tumors are found, and is intended to show osteoplastic flaps made by means of the Stellwagen trephine.

FIG. 2.



Cranial areas for osteoplastic operations with the Stellwagen trephine, these areas corresponding to the regions of the left hemicerebrum, with definite syndromes.

The following is the report of one of a series of three cases of brain tumor operated upon at the request of Mills. The case was one of localized meningitis and gumma of the motor region, to which the diagnosis was made by a clinical study and the Röntgen ray. The area for trephining was mapped out before the operation, according to the Anderson-Makins method. An osteoplastic resection of the skull was made by means of the Stellwagen trephine. As the membranes were adherent to the tumor it was necessary to remove them with the tumor. A flap of pericranium was reflected to replace the dura which had been removed. The patient recovered from the ether promptly, and, with the exception of one postoperative sinking spell, had no unfavorable symptoms. During the forty-eight hours immediately following the operation he had several spasmodic seizures involving solely the right side of the face. Four weeks after the operation the patient had made a perfect surgical recovery, his headache and Jacksonian epilepsy had disappeared, his eyes had improved, and in all respects his condition was excellent.

CASE II.—At the request of Dr. Mills,[1] Dr. W. J. Hearn operated upon a patient suffering from a tumor of the brain, which, with the aid of the Röntgen ray, was localized in the parietal region, possibly invading the motor region and extending to or compressing the posterior limb of the internal capsule and optic radiations. The site of the tumor was exposed by an osteoplastic operation. Hemorrhage was not excessive, but considerable time was required to make the flap, and when the dura was exposed it was found tense and bulging, with no visible pulsation of the brain. On turning back the dura a nodulated mass was found bulging into the opening, and exploration with the finger showed that on the surface of the brain at least this did not extend beyond the opening. In a few minutes the mass, one and one-eighth inches in its greatest diameter, was shelled out, and at first it was supposed this was the entire tumor, but, as will appear later, the tumor was broken off below the surface of the brain. The patient died in collapse within two hours after the completion of the operation.

CASE III.—The history of the third case of tumor of the brain recently reported by Mills[2] contains several points of more than usual interest. In the first place, the tumor which was removed entire was the largest Mills has ever seen taken from the living human brain; secondly, it was the second case in which a shadow of the tumor was obtained which coincided precisely with its position as determined by a careful clinical study and as confirmed by operation; and thirdly, because of the satisfactory control of hemorrhage during the operation by temporary closure of both common carotid arteries (Crile's method). The operation was completed in two stages, because in the exposure of the tumor hemorrhage was so profuse as to threaten the patient's life. Though the patient died a few hours after the final stage, Mills says that his experience with this case only makes him more decided in his convictions that operation should be resorted to in most cases of brain tumors when the neoplasm can be located in a region accessible to the surgeon's knife. In this particular case the tumor was of enormous size (measuring two and one-half inches in diameter), but was encapsulated, and had it been removed earlier the result in all probability would have been different.

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[1] Philadelphia Medical Journal, February 8, 1902.

[2] Ibid., September 27, 1902.

In the *Medical and Surgical Report of the Presbyterian Hospital of New York*, for 1902, M. Allen Starr and A. J. McCosh report an apparently successful case. The tumor occurred in a woman, aged forty-five years, lying in the right posterior central convolution in its middle third. At the operation a well-defined area was demonstrable, contrasting in color with the surrounding brain substance, and offering slightly increased resistance to palpation. The tumor, a round-celled sarcoma, 1 x 1 x 1½ inches, smooth and non-vascular, was removed apparently entire. One year after the operation the patient was, with the exception of some slight changes in the reflexes and certain sensory and motor disturbances, to all intents and purposes, well.

McGaskey and Porter[1] record a case in which a glioma, about the size of a pullet's egg, was removed from the right hemisphere. The median portion of the tumor had forced its way beneath the concave margin of the falx cerebri, and a considerable mass of it was removed from the left side of the cranial cavity. The finger was easily passed from the large space vacated by the tumor in the central region of the right hemisphere beneath the sharp concave margin of the falx, revealing a considerable space to the left of the falx. Hemorrhage was readily controlled by pressure, and the patient was not reported to have suffered from shock. At the last writing, which was ten months after the operation, there were no evidences of recurrence. The tumor was exposed by removing a quadrangular flap partly by the de Vilbiss instrument and partly by the Gigli saw.

Poirier is reported to have removed a tumor, the size of a man's fist, weighing about ten ounces, having taken its origin from the dura; the operative recovery was most satisfactory and the improvement in the patient's general condition very decided.

James Bull, of McGill University, operated upon a patient of Stewart's,[2] and removed a subcortical tumor encapsulated from one-half to one inch in diameter, situated at the lower part of the ascending frontal convolution. The patient reacted quickly from the immediate effects of the operation, and two months after the operation was practically well; with the exception of some slowness of speech, there was no evidence of any disturbance of the central nervous system.

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[1] Journal of American Medical Association, January 25, 1902.

[2] Montreal Medical Journal, January, 1902.

At the last meeting of the American Medical Association, Ransohoff, of Cincinnati, presented a report upon two operations for the removal of brain tumors; both operations were eminently successful in that there has been no recurrence; one case was free from recurrence nine years after the removal of a gliosarcoma, the other, from which a tubercular mass, weighing 12 grammes, was removed, was still in good health.

In a paper on operable tumors of the brain, von Bergmann[1] confines his remarks to his experience in the last few years, which includes one case of sarcoma of the frontal lobe; three cases of tumor of central origin (all three terminating fatally, and each of them serving as an example of the effects most to be feared in this operation, namely, shock, hemorrhage, and purulent meningitis), and two cases of cysts of the brain.

The first case proved to be a sarcoma so rich in vessels that it might almost be called an angiosarcoma. There were no particular difficulties attending the localization of the tumor, its recognition at the time of operation, or its removal. The patient recovered both from the immediate and remote effects of the operation, and up to the present writing has revealed no evidence of recurrence.

The first of the three fatal cases was a child, aged four and one-half years, in which the clinical picture pointed to the presence of a neoplasm extending from the motor to the precentral convolution of the left hemisphere. The child's condition grew rapidly worse, and the case became so desperate that operative intervention was deemed justifiable. The reflection of a large osteoplastic flap exposed a dura, very tense, non-pulsating, and contained many widely-dilated veins. The tumor was recognized, after reflection of a dural flap, and being encapsulated, was easily shelled out with the finger. The patient died in collapse immediately after operation. This case teaches us the danger attending delay; operation should not be postponed too long for the purpose of more accurate localization. The loss of blood and the shock to the entire organism, necessarily attending hemicraniotomy, were, no doubt, directly responsible for the fatal termination.

According to the author's tables which were published in 1899, 25 per cent. of cases died almost immediately after the operation. This suggests the question of the propriety or desirability of performing the operation in two stages. The author would not go quite so far as Horsley, who carries out this plan in every operation on brain tumors. In the first stage he opens the skull and postpones for from three to five days the reflection of the dura and the removal of the tumor.

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[1] Archiv f. klin. Chirurgie, vol. lxv.

Whether or not the operation should be performed in one or two stages will depend, in von Bergmann's opinion, in a large measure upon the patient's general condition, so that only in certain selected cases would it be advisable, perhaps, to follow Horsley's plan. In the future von Bergmann proposes in all cases in which, after reflection of the bone flap and the control of hemorrhage, collapse is imminent, to postpone further interference for several days.

In the second case he was convinced that the tumor, which was situated in the motor area, was a benign one and could be easily shelled out. Upon incising the dura there ensued alarming hemorrhage, quite as profuse as would have followed an incision into an aneurism of the femoral artery. Compression of the common carotid and packing of the wound seemed to have no effect, and so no further manipulations were possible, the wound was packed and closed; death ensued fifteen hours afterward. The tumor was a cavernous angioma.

The third patient, aged forty-six years, had what proved to be a round-celled sarcoma of the motor region. This was removed without any special difficulty, but the patient died on the fifteenth day after operation as the result of an extensive purulent leptomeningitis. Von Bergmann's attention was called in this case to the way in which the dura when separated from the skull throughout its entire extent will sink back when the patient's head is raised. When we suspect the tumor to be situated beneath the dura, but cannot feel it plainly, the patient's head should be raised; with the head in this position, the dura will be so relaxed that the presence of the tumor may be determined either by noting whether or not the dura bulges, or by being able to recognize by palpation a variation in the consistency of the surface of the brain.

Gussenbauer[1] has published a report of his experience in operations for the removal of brain tumors, which includes ten cases in hospital practice and seven in private practice. In summing up his views on the subject of brain tumors he says that his experiences lead him to agree with those who approve of the attempts at the removal of the tumors when they have been definitely localized. One may have been pronounced focal symptoms pointing to a lesion in the affected area, but not of necessity to a tumor. Focal symptoms in the region of the motor zone may prove to be signs of a tumor more deeply situated. One should give with great reserve a favorable prognosis with reference to recurrence after removal of a gliosarcoma, even when the incision for the removal of the tumor could be carried apparently into perfectly normal brain tissue. In Gussenbauer's case evidences of recurrence appeared in the third year after the operation. Two cases of tumor of the cerebellum, in which the diagnosis was confirmed at the autopsy, exhibited no symptoms characteristic of cerebellar tumor.

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[1] Wiener klinische Wochenschrift, 1902, Nos. 6, 7, 8.

As to the results of operation, in every case the wound healed by first intention, the only fatalities which can be attributed to the operation was the result of a severe consecutive hemorrhage, which was unquestionably due to the extreme restlessness of the patient. In one case death from pneumonia occurred ten days after the operation.

As the conspicuous effects of the operation should be mentioned the relief from pain in all cases in which it existed, the temporary disappearance of the choked disk, and the partial restoration of sight in those cases in which already atrophy of the optic nerve and amaurosis have not appeared. To these should be added the partial return of motor and sensory disturbances in the region of the face and the extremities, which must be accounted for by the relief afforded by the operation to the intracranial pressure.

Paralysis appearing on the unaffected side in cases in which the tumors could not be extirpated must be due to transitory disturbance of the cortical circulation, since it passes away in the course of a few days. Gussenbauer says that one may observe paralysis after the removal of a considerable portion of the dura mater, as might be necessary in extirpating tumors of the skull. In such cases the paralysis will be only transitory, providing it is not due to any loss of brain substance.

Gussenbauer, of course, uses the osteoplastic method of exposing the tumors, and prefers to all other instruments a saw (very much like the Hay saw). This method may require, perhaps, a little more time, but subjects the brain to no traumatism, and at the same time requires no complicated apparatus. He makes a point to saw through the skull obliquely in order that when the flap is replaced there will be no chance for encroaching upon the epidural space and giving rise to evidences of pressure.

TREPHINING AS A PALLIATIVE MEASURE IN THE TREATMENT OF CEREBRAL TUMORS. This method or measure has from time to time been suggested, but up to the present time it does not seem to have been practised with any frequency. There are many symptoms associated with tumors of the brain which make the life of the patient most pitiable, and not the least distressing of them is headache. If there is any reason to believe the tumor to be inoperable it should be considered charitable if not imperative to resort to the one measure that offers the slightest prospect even of only partial relief during the last days of the patient's life. There is sufficient evidence at hand to prove that in trephining we have a means of affording temporary relief.

Saenger[1] has employed this measure in his eleven cases. The operation should be performed as soon as vision is affected, and if there be no localizing symptoms, the trephine should be applied in the right parietal region.

One of Saenger's patients was a man, aged twenty-eight years, who, since 1898, had suffered from vertigo, headache, and vomiting. In August, 1899, when the patient was almost blind and much emaciated on account of the intense headache and frequent vomiting, he was trephined over the cerebellar region and his dura divided. Cerebro-spinal fluid continued to flow for three weeks. Since the operation the patient is free from pain, and can read and write; his speech is still indistinct, his gait rather uncertain, and in the mornings he complains of headache and nausea. The patient, in all respects, however, feels so well that he will resume work. The author then reports 11 cases of brain tumor. In 10 cases, through trephining, with divisions of the dura, the severe suffering of the patient was materially diminished, and the symptoms of cerebral pressure—headache, vomiting, convulsions—ceased. In 8 cases the choked disk disappeared; 2 cases became blind before the operation; and 1—a tumor at the base of the brain, producing great pressure on the pons and the corpora quadrigemina—died. In the latter case it is more than probable that the aqueduct of Sylvius was closed, since, after trephining, very little cerebro-spinal fluid escaped. There was, therefore, not sufficient release of pressure to afford any relief.

CEREBELLAR TUMORS. Attempts on the part of the surgeon to even expose much less to remove tumors from the cerebellum, are naturally attended with many difficulties often insuperable and with many dangers too often of fatal consequence. As though intimating that the cerebellum should never be subjected to exposure at the hands of the surgeon, nature has encompassed the cerebellum with such large cranial sinuses as the longitudinal, the straight and the lateral, so that only to a very limited degree can this structure be explored. Furthermore, of the three or more surfaces of the cerebellum the superior or the anterior, the median or internal, and the posterior or inferior, the latter alone is accessible. If the tumor be centrally situated or situated in the middle lobe or peduncles, in fact, upon any but the lateral aspect, it must be regarded as inoperable. Furthermore, it must be remembered that there are very distinct dangers attending manipulations upon the cerebellum, and more particularly if, in an attempt to get sufficient exposure as to excise a tumor, one should make too much traction upon the medulla. For these reasons, chiefly, and for others of lesser significance, the results of operative intervention for the relief of cerebellar disease have been almost fruitless. The desperate hopelessness of these cases as a class is, I believe, the only justification of a resort to surgical intervention.

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[1] Centralblatt für Chirurgie, 1902, No. 26.

In connection with two cases of tumors of the cerebellum operated upon by Jaboulay, Piollet[1] has tabulated all hitherto reported cases in the endeavor to draw some deductions as to the part which should be played by surgery in the treatment of cerebellar tumors.

As to the difficulty in finding the tumors, of the 50 cases which he has collected the tumor was found in but 21 cases; in 18 the tumor was more or less completely removed, or, if the lesion was tubercular, drained. The fact that in 60 per cent. of cases the tumor was not found should not be advanced as a contraindication to operation.

Lumbar puncture and puncture of the ventricles were employed in 10 cases, 8 of the former and 2 of the latter. Of the cases of lumbar puncture, in 4 there was transitory amelioration, 4 died within a few hours to a few days. Of the cases of puncture of the ventricles both died. This method, though capable of exerting but a palliative effect, seems to be one of unusual gravity in cases of cerebellar tumor. Furbinger, who is very much opposed to this practice, attributes the deaths to pressure exerted upon the bulb by the arrest of the cerebrospinal fluid from the ventricles at the foramen of Magendie. Whether this is the cause of the death, or whether death is due to a rapidly developing œdema of the brain, matters not, suffice it to say that the dangers attending puncture are so great as to be prohibitive.

Trephining is the one treatment deserving of consideration. The technique of the operation is capable of but little variation; the incision is usually U-shaped, but may be rectangular (as carried out by Jaboulay); the bone is trephined and the opening enlarged with the rongeur forceps. The question of dividing the operation into two stages must be decided by the individual operator. Jaboulay and Horsley have both expressed their preference for the two-stage method as being a means of lowering the degree of postoperative shock. For the purpose of discussing the results of the 50 tabulated cases we may divide them into two classes: (1) Trephining with more or less complete removal of the tumor, and (2) trephining for purposes of exploration.

CLASS I.—Eighteen operations yielded 1 death on the operating-table, 8 deaths shortly after, 9 cures or improvements, and 1 unknown. In several of the fatal cases the operation was performed at a single stage, and death might have been averted by dividing the operation into two stages. Parkin's patient has remained well for two and one-half years; Guthrie and Collier's patient has remained well for eighteen months; in a number of others the patients have continued well for several months.

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[1] Archives provinciale de Chirurgie, vol. x. p. 728.

CLASS II. includes those operations in which the tumor was found but not removed, or in which the tumor was not found, or in which the operation was performed for relief of pressure. In this series there were 32 cases, 4 deaths during the operation, and 15 deaths shortly after, 12 improved, and 1 lost sight of. The higher mortality attending this series may be explained by the facts that in many of the cases the tumor was very large, or the patient's condition unfavorable, or the search for the tumor was very prolonged. Of the 4 deaths, 1 was due to hemorrhage, and 3 to syncope of bulbar origin. It is interesting to note that in these three cases respiratory failure occurred from one to four hours before the heart failed, and despite the employment of artificial means the respiration could not be re-established. The heart's action finally became irregular and ceased. Of course, bulbar shock is particularly to be dreaded in cerebellar operation. Of the other fatalities two were due to infection, several to the operation itself, and some to collapse and shock.

PROGNOSIS. When one can remove the tumor the chances of either complete recovery or permanent improvement are about two to one. Better results may be obtained, Piollet believes, by dividing the operation into stages. Certain it is that if the attempt to remove the tumor is not made until the second stage, it may be accomplished with greater ease, with the least degree of traumatism to the brain, and with less shock.

Jaboulay has noticed the beneficial effect attending the escape through a fistula in the scar of cerebro-spinal fluid, and would recommend the establishment of such a fistula in cases in which improvement has not followed the operation or in which the improvement was only transitory. The danger of infection should not constitute a contraindication to the adoption of the plan.

Piollet sums up his conclusions as to the treatment in the following words: The treatment should be surgical in the majority of instances. Lumbar or ventricular puncture should be discarded as too dangerous. The operation should be performed in two stages, at the first trephining and incising the dura. If after this the symptoms reappear, one should proceed with the second stage several days later, at which time the removal of the tumor will be much easier of execution. If the tumor cannot be removed a fistula should be established for the purpose of draining the cerebro-spinal fluid which in this condition is present in excess. This will be followed by almost as much improvement as if the tumor had been extirpated *in toto*.

Cysts of the Brain. Jonnesco,[1] after reviewing the histories of the 15 cases hitherto recorded in literature, reports an additional case coming under his own observation. The patient was seventeen years of age, and the diagnosis was based upon the following symptoms: headache, vomiting, disturbance of vision, unequal pupils, choked disk, œdema of the retina, spastic paraplegia of the right extremities, persistent constipation, and retention of urine. An osteoplastic operation was performed, and after exposing the brain an incision was made in the mid-parietal lobe, from which a cyst about the size of an orange was removed. The patient has been under observation for a period of one year without evidences of recurrence.

Thien reported before the German Surgical Congress a case of cyst of the occipital lobe, the wall of which was formed by the dura and arachnoid. The cyst, afterward successfully removed, was believed to be due to a localized serous meningitis.

Pneumatocele of the Skull. This exceptionally rare lesion was observed by Strom[2] in a patient who for a period of eight years had had symptoms of a left otitis media. There was a swelling of the left supramastoid region, painless and tympanitic, covered by a thin osseous wall, which, on exploration, presented a stalactitic formation springing from the lower part of the parietal, the squamous portion of the temporal, and the greater wing of the sphenoidal bones. The air which came from the middle ear collected in a space between the pericranium and skull. Recovery followed removal of the superfluous bone and drainage of the cavity.

Tic Douloureux. DIVISION OF THE SENSORY ROOT OF THE GASSERIAN GANGLION. A year ago this section contained a very full account of the investigations of Spiller and myself[3] as to the effect of division of the sensory root of the Gasserian ganglion for the relief of tic douloureux. At that time but one such operation had been performed, and as but a few months had elapsed between the time of the operation and the announcement of the results, and while at that time there was absolutely no recurrence, we did not feel as though sufficient time had elapsed to warrant their considering the relief as permanent. At a meeting of the College of Physicians held in October, 1902, a further report upon this treatment of tic douloureux was presented by Spiller and myself.[4] As this operation had been performed but once upon the human subject, and as it overcomes many of the difficulties besetting the extirpation of the ganglion, it seemed only proper

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[1] Revista de Chirurgie, 1902, Nos. 2 and 3.

[2] Nordskt med. Arkiv, 1902, No. 2.

[3] University of Pennsylvania Medical Bulletin, December, 1901.

[4] Philadelphia Medical Journal, October 25, 1902.

that the record of this case should be made public now, after the lapse of a year, as the time had arrived when the recovery could justifiably be regarded as permanent. The patient has had absolutely no recurrence of pain, the area of anæsthesia corresponds now in extent to that recorded one week after the operation; the cornea and conjunctiva upon the unaffected side are completely anæsthetic. The advantages claimed for this operation over that requiring extirpation of the ganglion have been exhaustively treated,[1] as was also the question of the regeneration of the sensory root. At that time Spiller said that the possibility of regeneration of the sensory root was very remote, and the subsequent course of the case in which the root was divided has proven this. Not only have we clinical evidence in support of Spiller's views, but the most modern views as to the method of nerve regeneration as advanced particularly by Bethe, Ballance, and Stewart are altogether in accord. These observers have demonstrated that the former teaching concerning nerve degeneration must have been incorrect, viz., that the new axis cylinders in a regenerating nerve are direct outgrowths of the axis cylinders in the central segment of the divided nerve. According to the findings of Ballance and Stewart, regeneration takes place solely from the nuclei of the sheaths of Schwann in the peripheral segment, but full maturity of the nerve fibre is not attained unless the distal segment be joined to the proximal, so that the fibres may become functionally continuous. Spiller says: "In the acceptance of an almost abandoned theory, now revived, we probably have the explanation for the durability of the relief from the pain in the patient on whom Frazier has operated. If nerve fibres have grown out from the nuclei of the sheaths of Schwann, of the sensory root of the trifacial nerve in this case—and that is doubtful—they evidently have not been able to extend beyond the portion at which the sheaths of Schwann cease, namely, at the entrance of the root into the pons. The motor root in this patient has not been restored any more than the sensory, for there is still paralysis of the muscles of mastication upon the operated side. It may be urged by some that one year is not sufficient time for a determination of the permanency of the relief in this case, and that, even after one year, return of pain has occurred after peripheral resection of the trifacial nerve. I doubt very much whether pain has first recurred after a year in any case in which the anæsthesia in the area of the resected nerve has been complete one year after resection, or the muscles of mastication remained paralyzed so long a time. The course of the nerve is not destroyed by peripheral resection, and the relation of the parts are such that the surrounding tissues afford a means of conduction for the young nerve fibres. This is not the case after division of the sensory root of the trifacial nerve. The peripheral end of the divided root doubtless retracts, and it is not probable that the delicate young nerve fibres—if we grant that they are formed at all—could find their way across the subdural space and penetrate the dense transverse fibres of the middle cerebellar peduncle and the longitudinal fibres of the pyramidal tract to reach the sensory nucleus of the trigeminus situated deep within the pons, and thereby establish a connection with the brain."

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[1] PROGRESSIVE MEDICINE, March, 1902.

From the number of inquiries received from surgeons in various parts of the country, I believe that the modification of the surgical treatment of trifacial neuralgia is being given a very fair trial. Both Spiller and myself feel that the testimony and experience of others are needed concerning the advisability of the operation, although the result of one successful case cannot be ignored.

Several operations have since been performed, although none of them as yet reported, among them, one by myself and one by Keen, who expressed the opinion that from the operative point of view it was a much less difficult operation than avulsion of the ganglion, chiefly because of the lessening hemorrhage which left the operative field much more free.

REMOVAL OF THE GASSERIAN GANGLION. J. B. Murphy and Neff[1] have collected 42 cases of removal of the Gasserian ganglion, in addition to Corsin's series of 100 cases, the mortality of the total 142 showing a reduction from 22.2 per cent. (Tiffany 108 cases, 24 deaths) to 15 per cent. The large majority of Murphy and Neff's series were performed during or since 1899, and in this series there were but 6 deaths—a mortality of but 10 per cent. This, I believe, is a very fair and conservative estimate of the mortality that should attend those operations since the recent improvements in technique, and as time goes on I believe we shall see a very material reduction of this figure. Certain it is that we need no longer regard operative attacks upon the Gasserian ganglion as belonging to the desperate "kill or cure" class of surgical measures. Murphy and Neff, in their paper, narrate their personal experience with 10 Hartley-Krause operations, 3 of which terminated fatally.

William Rose,[2] who was the originator of the method known by his name for exposing the ganglion, reports a case of removal of the Gasserian ganglion by Doyen's method—a combination of the Rose and the Hartley-Krause operations. In reviewing the relative merits of the

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[1] Journal of American Medical Association, October 11, 1902.

[2] Practitioner, May, 1902.

Hartley-Krause and Doyen operation, Rose said that after comparing the two he strongly favored the latter. The Doyen method requires the removal of a much smaller section of the skull, inasmuch as the opening is made at a lower level, and does not require the preservation and replacement of the bone. In the Hartley-Krause plan the opening is made through an exposed region, and the bone must be preserved. Wagner's osteoplastic method of opening the skull is theoretically very desirable, but consumes too much time, and is, on the whole, a troublesome procedure; in it the ganglion must be approached from above, and its exposure without section of the zygoma involves very considerable pressure upon the temporosphenoid lobe. The claims made by Rose for the Doyen operation would not be sustained by any surgeon in this country, and by few in England or in Germany. I suppose that probably 99 out of every 100 operations which have for their object the exposure and removal of the ganglion are done by the Hartley-Krause plan or a modification of it.

The patient upon whom Rose operated reacted promptly, and his convalescence was uninterrupted; complete anæsthesia was present over the region of distribution of the second and third divisions of the nerve, but sensation was present in the supra-orbital region and the conjunctiva. The patient left the hospital about three weeks after the operation and complained that he had experienced one or two unpleasant twinges of pain in the supra-orbital region, somewhat suggestive of the original complaint.

From von Bergmann's clinic comes the report of fifteen operations upon the Gasserian ganglion performed by Lexer,[1] and as a result of his experience of these cases he has adopted certain modifications of the Hartley-Krause method that are worthy of mention. In the first place he makes a smaller temporal flap, but in order to afford a sufficient exposure of the ganglion he resects the zygoma and removes the base of the skull as far as the foramen ovale. The incision in the scalp begins somewhat above the external angular process in order to avoid injuring the branches of the facial nerve, which supply the orbicularis oculi muscle, and terminates about a finger's breadth in front of the ear. The upper margin of the flap does not extend beyond a line connecting the supra-orbital margin with the superior border of the auricle. The middle meningeal artery is ligated as a routine practice. Particular stress is laid upon the advantage of elevating the head and body of the patient when one begins to separate the dura from the base. In this position the brain drops back into the posterior cerebral fossa to such an extent as to make it unnecessary to elevate the brain, and avoids the traumatism to which the brain would otherwise be subjected. Venous hemorrhage was found to be very much less troublesome after the head was elevated. The duration of the operation varied from forty-five minutes to an hour and a half. The results were exceptionally good. Of the 14 cases but 1 terminated fatally, the patient dying of meningitis four days after the operation, and the autopsy revealed a psammoma the size of a nut in the posterior cranial fossa. The tumor surrounded the trigeminus, the auditory and facial nerves; but as there was nothing suggestive of a tumor, the fundus of the eye had not been examined. Twelve of the remaining cases remained free from recurrence, once neuralgia developed subsequently in the non-operated side, and once there was a recurrence. Once there was a transitory aphasia and somnolence; 10 of the patients recovered, with no ocular disturbance, in 2 cases corneal ulcers developed, which resulted in 1 in loss of vision, in another in a slight permanent opacity. In 2 cases paralysis of the abducens was noted. Lexer regards the injury to the cavernous sinus as an unavoidable complication, and, as in one of his cases, the resulting hemorrhage may be so severe and troublesome as to make it necessary to divide the operation into two stages. Of the 201 cases which the author has tabulated, 33, or 17 per cent., died immediately or soon after the operation, and of those surviving 93.4 per cent. have remained free from recurrence. In two out of every three cases the affection was on the right side; in 10 cases the hemorrhage was so profuse as to require the division of the operation into two stages; frequently there were such transitory disturbances as vomiting, delirium, and headache; occasionally paralysis varying from paralysis of the abducens to complete hemiplegia. In two instances keratitis was followed by loss of vision, and twice the eye was enucleated.

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[1] Archiv f. klin. Chirurgie, Band lxv., Heft 4.

It is difficult to understand why some of the German surgeons deem it necessary or expedient to remove so much from the base of the skull in order to procure adequate exposure of the ganglion. We have just described Lexer's recommendation, and now refer to an operation reported by Krause, who, in addition to the zygoma and temporal bone, resected a portion of the malar bone and the wall of the orbit, down to the foramen rotundum. The patient, who had been subjected to a peripheral operation four years before, enjoyed an uninterrupted convalescence, and was reported as perfectly well a year later.

In the case reported by Erdmann,[1] very active delirium developed during the postoperative period, and the febrile reaction was so pronounced and so persistent that infection was feared; on two occasions the wound was opened, but in neither instance was any pus found.

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[1] Medical News, April 12, 1902.

RESECTION OF THE CERVICAL SYMPATHETIC. The treatment of trigeminal neuralgia by resection of the cervical sympathetic was first suggested by Cavazzani.[1] He has operated upon 8 cases, and all recovered. The relief is believed to be due to certain modifications in the nutrition of the Gasserian ganglion occasioned by the resection of the filaments which connect with the sympathetic. The pain was not relieved immediately, but gradually subsided with the lapse of time.

STRYCHNINE IN TIC. The remedy which of late years has proven most efficacious in the alleviation of the pain of trifacial neuralgia is strychnine administered in heroic doses. Many cases have enjoyed absolute relief from pain from this treatment, although often the relief has been but transitory.

ACONITINE IN TIC. Barber[2] found that the administration of $\frac{1}{10}$ milligramme of aconitine every four hours until the patient had taken four granules was followed by absolute relief. The administration of this drug was followed up with a pill containing iron and anthemis. The results of this single observation led the author to believe that aconitine might be a specific remedy in the treatment of true "tic."

Cerebral Sinuses. Riegner[3] was called upon to treat a *subcutaneous rupture* of the *longitudinal sinus* associated with a fissured fracture of the skull, caused by the patient being struck on the head by a falling scaffold. The patient had a very extensive hæmatoma of the right frontal and parietal region, no paralysis, but marked headache, slight fever, a pulse of 52 rising gradually to 102 on the fifth day, dilatation of the right pupil, and left choked disk. On the sixth day the region was explored, the hæmatoma evacuated, and a fissured fracture discovered, through the line of which there was a continuous hemorrhage. On removing a section of bone along the line of the fracture there was a tremendous gush of blood, watery fluid, and clots, which demanded immediate tamponade and put a stop to further exploration. The patient was somewhat shocked, but enjoyed immediate relief from pain. Four days later the packing was removed and a rent in the sinus, 1½ centimetres long, discovered and closed with catgut sutures. Apart from a bilateral optic neuritis, which was only transitory, convalescence was uninterrupted.

THROMBOSIS. In an experimental investigation into the etiology of sinus thrombosis, Dorr[4] conducted a few crude experiments in which he succeeded in producing a thrombosis by striking the animal on the head with a hammer. Though not being able to prove it by microscopic demonstration, he believes the lesion is due to the injury inflicted by the blow upon the endothelial lining of the sinus.

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[1] Gazetta degli Ospedali, January 26, 1902.

[2] New York Medical Journal, 1902.

[3] Deutsche med. Zeitschrift f. Chirurgie, Band lxii.

[4] Münchener med. Wochenschrift, 1902, No. 8.

THROMBOSIS OF THE CAVERNOUS SINUS is a lesion which has rarely been recognized antemortem, still more rarely operated upon, and extremely fatal. Up to the appearance of Dwight and Germain's[1] report of 4 cases but 178 have been reported, and of these but 14 recovered. It has usually been taken for granted that on account of its position the sinus was not available for surgical interference, and with few exceptions all authors agree that the only justifiable treatment was that of drainage of the orbit, sometimes to be associated with excision of the eyeball. When the cavernous sinus has been involved by extension from the lateral sinus an attempt has been made to drain all the basal sinuses by opening and curetting the lateral. This operation has been performed successfully in 3 cases. There are but two instances in which the cavernous sinus has been deliberately exposed, opened, and drained, once by Hartley and once by Dwight and Germain. This latter case survived the immediate effects of the operation, but died shortly afterward. According to these observers the arguments against operation are these: The inaccessibility of the sinus, the coexisting toxæmia which is present in most cases, and the belief that thrombosis of a single sinus or limited to the cavernous sinus must be rare. But all of these arguments can be refuted. As to the first, it has been proved that the cavernous sinus is not inaccessible; as to the second it is hardly fair to say that, because toxæmia of a grave degree attends the latter stages of this disease, no operation should be performed; and as to the third, autopsy records show that in a considerable number of cases the thrombosis is limited to one or both cavernous sinuses. With the hope that surgical interference may be more frequently attempted, the following points as to the etiology, symptoms, and diagnosis are called attention to. Of the etiological factors infection is by far the most common. Infection of the sinuses may occur by extension from contiguous structures (meningitis, disease of the bone, abscess); by extension through the tributary veins, as the ophthalmic with its branches from the face and scalp; through the pterygoid plexus and its branches, from the mouth, nose, and pharynx; by extension of thrombi from other sinuses. Traumatism, the second most common etiological factor, may be applied to the sinus either directly or indirectly; thus, for example, injury to the head with or without fracture, blows upon the head, punctured wounds through the orbit. Debilitating diseases cause miasmic thrombosis, but usually of the longitudinal sinus. The symptoms may be divided into two general classes, those due to septicæmia and those due to local circulatory disturbances affecting chiefly the eye. Usually the inflammation spreads rapidly from one sinus to the other. If the thrombosis be of slow formation, a collateral circulation may be established so that the symptoms may not be so marked. When the onset is sudden, exophthalmos, œdema of lids, conjunctiva, and face, with dilatation of the frontal, supra-orbital, and angular veins appear very soon. Within forty-eight hours the thrombotic process has spread to the opposite sinus, and the same train of symptoms develop. By the time the general condition has become very grave, and the diagnosis therefore easier, the probability of relief from surgical interference is proportionately reduced. Choked disk, optic neuritis, and corneal ulceration should be included among ocular manifestations, as well as diplopia, dilatation of the pupil, exophthalmos, and blindness. Pressure of the thrombus upon the third, fourth, fifth, and sixth nerves will cause paralysis and anæsthesia.

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[1] Boston Medical and Surgical Journal, May 1, 1902.

As to the diagnosis, the presence of acute exophthalmos associated with toxæmia should make one at once suspicious as to the existence of either an orbital cellulitis or cavernous thrombosis.

The changes in the fundus are never so marked in orbital cellulitis; obstruction to circulation is much less, and the headache is supra-orbital rather than deep-seated. Constitutional symptoms are much less severe in orbital cellulitis, and if the symptoms extend to the other eye the diagnosis of thrombosis of the cavernous sinus is practically assured. When the source of infection exists in any of the regions which are drained into the cerebral sinuses, and when the symptoms presented are suggestive of circulatory disturbances within the skull, the possibility of sinus thrombosis should always be considered.

Dwight and Germain have summed up their conclusions in the following words: "If we allow for the possibility of error in the cases reported, and we are entirely justified in so doing in a condition where so little is known and the symptoms are so indefinite, we must recognize thrombosis of the cavernous sinus as an extremely fatal condition. There is no way of deciding what the mortality in unoperated cases really is. The majority of writers on the subject consider it almost if not quite necessarily fatal. If we tabulate all the cases reported we might arrive at a false opinion as to its fatality. Cases are reported so inaccurately that it is usually impossible to judge as to whether good reason existed for the diagnosis. At least it will be accepted that if not always fatal it is always serious and fatal in the vast majority of cases.

"Death following this condition is due to septicæmia or pyæmia, and, in well-established cases, operation in one form or another offers the only hope of recovery. Excision of the eyeball, with curettage of the ophthalmic vein, is insufficient, and is recognized as being so even by the advocates of this method. Operation upon the lateral sinus has apparently, in a few cases, relieved thrombosis in the cavernous sinus, but it is usually without effect, and must be so if the thrombus is a primary one or is well formed.

"It has been recognized by several authors that the rational treatment would consist in opening the cavernous sinus directly, but this has not been attempted on account of the grave difficulties and dangers which were supposed to be associated with it. So far as is known this operation has been done but twice: once in the case reported in this paper and again in that of Hartley and Knapp one month later. Hartley's operation demonstrated that it may be done without grave danger to the patient, providing the patient be in fairly good condition. In his case, which was not an acute one, the patient withstood the operation and lived for several months, dying as a result of his original disease —sarcoma. The case reported here is entirely in accord with this view, as certainly his condition was not made worse by the operation.

"Our case shows that an incision into one sinus instantly and completely relieved the interference with circulation in both. It also demonstrated the fact that such an operation is not associated with extreme difficulty, that it can be done under almost primary anæsthesia, not associated with any degree of shock, finished within a few minutes —in this case eight—and that the hemorrhage is easily controlled.

"These two operations would apparently justify our belief that thrombosis of the cavernous sinus is distinctly an operable condition, and that the operation described herein holds out reasonable hope that its acceptance may be followed by a decrease in the present mortality in this serious condition."

Epilepsy. The surgical treatment of epilepsy is one which has been in vogue many years, and yet to-day we stand surrounded by a mass of evidence, and statistics, and opinions, while not worthless, yet most confusing. The confusion is partly due to the fact that very few cases are kept under observation for any length of time, as von Bergmann says cases are reported cured before the wounds have healed; partly to the fact that too little effort has been made to discriminate between those cases which are suitable and those not suitable for operation; and finally, in part, to our ignorance regarding the pathogenesis of those cases not Jacksonian in type. Park has classified those cases of epilepsy which present surgical phases as follows:

a. Those presenting reflexes from peripheral irritation—*e. g.*, those caused by phimosis, by sensitive scars, by rectal or nasal polypi, and probably those connected with eyestrain.

b. Cases of gross anatomical lesions within the cranium—*e. g.*, pachymeningitis, tubercle, gumma, or brain abscess, bone fragments, deep brain scars, cysts, adhesions, results of old fractures, etc. A lesser group should also be made to include external scars, depressions, etc., about the skull, results of traumatism.

c. Cases of so-called essential epilepsy of non-traumatic origin, presenting distinct localizing phenomena. In a discussion of its surgical treatment we may well, but somewhat differently, classify cases which justify it under two headings :

a. Those which call for relief of some peripheral irritation—*e. g.*, circumcision, excision of scars, or irritable ulcers, etc.

b. Those in which operative intervention is directed toward the nerve centres.

This class of cases again needs subdivision into:

1. Those in which these centres are indirectly influenced, to be treated perhaps by ligature of the vertebral arteries or by excision of the cervical sympathetic.

2. Those calling for direct attack upon the brain or its membranes, including craniectomy (trephining) and deeper work upon the parts thus exposed.

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The various operative procedures include: 1. Simple trephining or craniotomy which, as Kocher suggests, may be of benefit in affording relief to and equalizing the intracranial blood pressure. On this basis Kocher seeks to prevent by artificial means the closure of the opening. 2. Excision of the cervical sympathetic, an operation practised by Alexander first in 1883, but receiving recognition chiefly through the efforts of Jonnesco. 3. Horsley's method of excision of the motor centre in the cortex. 4. Trephining, as in cases of Jacksonian epilepsy, with a view toward removing some gross anatomical lesion within the cranium, involving either the brain or meninges. 5. Operation for the removal of some source of peripheral irritation—*e. g.*, circumcision, excision of scars, etc.

The indication for these various operative procedures may be appropriately considered at this juncture. No one will dispute the propriety of operating upon cases of true focal or Jacksonian epilepsy, although, even in cases where some source of irritation has been found and removed, the results are anything but brilliant. Failure to achieve better results is due, in part, to the relatively late period at which operations are performed. Years have elapsed while the family physician has been experimenting with numberless drugs, and when the patient is brought to the surgeon he is at best a poor surgical subject and one in whom the epileptic habit is thoroughly established. The technique to be employed in the operation will depend very largely on the conditions that exist in each individual case. In all, however, Mills thinks it most desirable to perform an osteoplastic operation, preferably with the Stellwagen trephine, in order that the operator may have an exposure of an extensive area of the cortex. Many operations have failed to afford relief simply because the limited field which has been exposed to view by the average trephine has not included the lesion. Once a free exposure of the motor region, or the region about the seat of an old fracture, has been made, the subsequent steps of the operation will depend upon the circumstances of each case. A tumor, gumma, abscess, scar, cyst, adhesion, or depressed fragments of bone, if present, should, of course, be removed; but failing to find any of these, should the operator be content with simple exploration or should he proceed to practise excision of electrically determined areas as advised by Horsley? This question can only be answered indirectly by stating that the procedure has not been adopted by anything approaching a majority of practising surgeons; that the danger of subsequent paralysis must always be taken into consideration, and that there is always a chance of one not reaching the seat diseased. Naturally an advocate of this operation would present the operation in a more favorable light. Thus Rassumowasky says: "The method of Horsley has given unquestionably good results in the treatment of Jacksonian epilepsy, both the traumatic and non-traumatic variety. It may be that in further elaboration of the technique the results may be more promising; but, be that as it may, this treatment, as any other which gives in a certain percentage of cases long-continued relief, is deserving of future recognition; it demands further investigation and study."

If an operation is performed with a view toward separating any adhesions that may be present between the dura and skull, or dura and brain, it has been suggested that this measure should be adopted of preventing the re-formation of these adhesions. Thus Parker[1] operated upon a traumatic epileptic with an adhesion between the skull and dura, and inserted between these two a piece of gold-foil. The patient had sustained a compound fracture of the skull a number of years ago, at which time he was trephined, and subsequent thereto developed an epilepsy. Eleven years afterward the scar over the site of the former injury was excised, the integuments loosened from the bone and sewed together over the aperture. This afforded him relief for his epileptic seizures for almost six years, when they again recurred and the following operation was undertaken: A semicircular flap, including the old scar, which was adherent directly to the brain, was dissected free. The dura mater was found turned out along the margins of the bone aperture, adhering to it and to the outer surface by scar tissue. This was all stripped with a raspatory, and also freed from the inner table for some distance all around the aperture, and laid down on the exposed brain, leaving a central portion uncovered. The hole in the bone was oval, measuring one inch or less in one direction, and more in the other. On the exposed brain and dura mater, passing between the latter and the skull, were laid pieces of stiffish gold-foil, cut from Ash's No. 60 (piece about four inches square that weighed one-eighth of an ounce). It was found impossible to pass in a single oval piece a little larger than the bone aperture with anything approaching smoothness or neatness, so one smaller piece that broke off was laid on as well as could be done, followed by two more pieces, all by this time thoroughly crumpled. The skin flap was closed down by a continuous mattress suture, without attempt at ligature of the numerous vessels that now bled again on removing the compression forceps which had been applied to the cut edges. Finally all was covered up under cyanide gauze and a capeline bandage.

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[1] British Medical Journal, May 4, 1902.

About a month after the operation the patient said that he had never felt better in his life. No pulsation has been noticed over the gap in the skull since the operation. The clearness of his recollections and the quickness and certainty of his perceptions and replies were quite noteworthy as compared with his condition prior to the operation. In every way he appeared in excellent health and spirits. Save one fit, on the day immediately after the operation, he has had no epileptic seizures.

What operation is called for in the so-called *idiopathic* or *essential epilepsy?* This will depend upon whether we regard the circulatory disturbance which is the commonly accepted theory of to-day—to be one of anæmia or hyperæmia. Speaking of the difference of opinion entertained by surgeons with reference to the blood supply of the brain during epileptic attacks, Park says: "For my own part I see no reason to feel that epilepsy is always one and the same disease, and I believe that quite different conditions may prevail in different cases. In certain so-called essential cases, when no external sources of irritation are visible, and when it does not assume the Jacksonian type, but when it is more probably of visceral or toxic origin, I believe that it may be produced by toxins which have a vasodilator rather than a vasoconstrictor effect. And in cases of the Jacksonian type, or of traumatic or peripheral origin, again, I believe that it is possible to have variations in vascular pressure which are not produced through the mechanism of the cervical sympathetic, and for whose suppression various surgical procedures may be demanded. But I would not go so far as to say, with Braun, Dejerine, and Bergmann, that no case of essential epilepsy justifies surgical treatment. The very expression 'essential epilepsy' implies a confession that the source of the irritation has not been discovered."

If, as in some cases, the condition is believed to be due to cerebral anæmia, in cases characterized by blanching of the face, when the seizures can be warded off with amyl nitrite, the propriety of excision of the cervical sympathetic may well be considered. Since, then, the vasoconstrictor nerves are mainly found in this structure, its removal should abolish vascular spasm; accordingly this operation is physiologically correct.

If, on the other hand, the lesion is believed to be one of hyperæmia, excision of the cervical sympathetic would be manifestly contraindicated, and the only operation which would relieve, theoretically at least, the hyperæmia is craniectomy.

Results. Whatever operation may be selected and performed, good results should be expected only by regarding the surgical intervention as the first step in a prolonged course of treatment which shall include most careful attention to the diet, to the elimination, and to general hygiene. "Long-continued attention to these matters is the price of eventual success." (Park).

For purposes of comparison we quote some statistics showing the results which have followed the various operations. Winter[1] has recently collected the records of resection of the cervical sympathetic of 213 epileptics upon whom the operation had been performed; the records of 91 may be excluded because none but the immediate results were recorded. Of the remainder none are designated as recovered unless they have been free from convulsions for a period of three years. In this class there were 6 per cent. in whom accurate observations were recorded for a sufficient length of time; 13.9 per cent. of the total have been free from recurrence for periods varying from eight months to two years; in 18.9 per cent. the convulsions recurred with greater or less frequency, 5.7 per cent. of cases died, and in 54.9 per cent. the effect of the operation was *nil.* While these results are anything but brilliant, considering the almost hopeless nature of the disease, a percentage of 6.6 per cent. of recoveries is not to be ignored. Comparing the effect of bromide treatment in some of the great sanitariums, as that at Biegefeld, for example, but 1.72 per cent. of recoveries and 3.35 per cent. of improvements were obtained in a series of 8000 cases. Though excision of the cervical sympathetic is by no means a new operation, there are many disputed questions as to the technique and as to the cases most suitable for operation. According to Bidal those epileptics who respond readily to amyl nitrite are more suitable for this operation than others, and, what may be said of any operation, those patients who have comparatively recently developed epilepsy and in whom the "habit" is not fully established.

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[1] Archiv f. klin. Chirurgie, Band lxvii., Heft 4.

Winter's personal experience with the sympathetic operation includes 9 cases; 1 is reported as absolutely cured; 1 much improved; 5 unimproved, and 2 unknown.

As to the results of *craniectomy for epilepsy*, Rassumowsky[1] published his own records of 9 cases of cortical epilepsy, in 7 of which the Horsley method was practised. The results were as follows: Case I. After three years' observation had no recurrence. Case II. At the fifth year had no recurrence. Case III. Died within a year of septic meningitis, but up to that time had remained free from attacks. Case IV. Died of some intercurrent affection within a year, so that the case is valueless. Case V. Had a recurrence within four months, the attacks appearing only during the night, whereas before the operation they occurred during the day as well. Case VI. Yields after three years a negative result. Case VII. After lapse of two years and eight months could only be said to be slightly improved.

To sum up the results in a way that could not be accused of optimism, we may say that in 3 cases the results were exceptionally good, and of these, 2 may be said to have been brilliant.

Braun collected 30 cases of *traumatic epilepsy* operated upon by Horsley's method, and 13 of these are reported as recovered, and 9 as improved, 8 as unimproved. Matthiolus found 14 cases of non-traumatic epilepsy with but 1 recovery and 10 negative results. He has also collected 208 cases of craniectomies for Jacksonian epilepsy, of whom 20 per cent. were reported as cured, though only 10 of the entire number had been followed for over three years, and only 10 for more than one year. Of the remainder, 15 per cent. were reported improved, 56 per cent. unimproved, and 13 per cent. died.

Kocher has trephined 11 cases which he followed for from two to nine years; 6 of them recovered, and 5 were unimproved.

For the purposes of comparing the results of surgical methods with those carried out at one of our epileptic colonies, such as the Craig Colony, where the patients receive the best care and the most intelligent medical treatment that the world at present affords, we quote the opinion of Dr. Spratling, who says that under proper treatment, that is, under conditions that enable us to control absolutely all the habits of the patient, from 8 per cent. to 10 per cent. taken in time and treated long enough may be made to recover.

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[1] Archiv für klin. Chirurgie, Band lxvii., Heft 1.

THE FACE.

Facial Palsy. Since the publication of the work of Faure and Furet, in 1898, there have been very few contributions upon the subject of the relief of facial palsy by anastomosis of the spinal accessory nerve with the facial nerve. In addition to these researches, Manasse[1] and Breavoine[2] have conducted experiments on animals, which so confirmed the results of Faure and Furet that they at once indorsed the views of the originators of this operation, and recommended its performance in properly selected cases. The experiments upon animals were conducted with great thoroughness, and the results were most convincing. Not only was the function in the structures supplied by the facial nerve restored, but a microscopic study of sections of the nerve showed that union of the segments of nerve through regeneration of its axis cylinders had occurred. The operation is indicated in those cases of facial palsies in which recovery or improvement can no longer be hoped for, and in cases of facial contractures. The performance of the operation is attended with considerable difficulty because of the inaccessibility of the nerve trunks, particularly of the facial, and because of the proximity of the latter to the internal jugular vein. An incision is made from the tip of the mastoid process downward along the anterior border of the sternocleidomastoid muscle for a sufficient distance to expose the spinal accessory nerve at the point at which it enters the sternocleidomastoid muscle. The nerve is isolated from this point up to a point within about an inch of the jugular foramen. This step in the operation should precede the isolation and exposure of the facial nerve, as it will allow of better retraction of the sternomastoid muscle. The posterior border of the parotid gland is now carefully dissected free from its attachments, and the gland is retracted forward in order to enable one to expose the facial nerve. When this is reached it is dissected free up to its emergency from the stylomastoid foramen. At this stage of the operation the greatest precaution must be taken to avoid injuring the internal jugular vein. The facial nerve is divided as near as possible to its exit from the mastoid process in order that the peripheral segment may be long enough to allow of one effecting an anastomosis with the spinal accessory. The spinal accessory may either be completely divided at such a point as will allow of easy approximation without undue tension of the central segment to the stump of the facial, or, if the facial segment is of sufficient length, it may be grafted into the substance of the undivided spinal accessory. Although the

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[1] Archiv f. klin. Chirurgie, Band lxii., Heft 4.

[2] Travaux de Neurologie Chirurgie, 1901, No. 2.

operation is quite difficult of performance, it will be rendered less so if one follows the longitudinal facial planes and does not divide them transversely. In so doing the anatomical relations of the structures are disturbed to the minimum extent. The structures which are apt to be confused with the two nerves in question are the auricularis magnus nerve and the collateral vessels as they enter the parotid gland. The peripheral segment of the facial nerve must be manipulated with great care in order to avoid laceration or injury of its substance. As after similar operations upon nerves in any situation, it should be borne in mind that it requires a considerable period of time for the nerve trunks to undergo regeneration and repair, and one should not expect to procure the desired result too soon.

The results of Kennedy in his treatment of facial contractures and of others in the treatment of facial palsies are sufficient to warrant the adoption of this operation. In at least one instance in which a portion of the facial nerve was totally destroyed by a gunshot injury anastomosis as above described was followed by a brilliant result, function being entirely restored. The earlier the operation is performed the better will be the prognosis, so that just as soon as the case proves to be one intractable to the usual modes of treatment the operation should be practised without delay.

Paraffin Prosthesis in the Treatment of Nasal Deformities. The correction of nasal deformities, particularly saddle-nose, by means of the subcutaneous injection of paraffin has passed the experimental stage and is now a well-established method. The method consists essentially in injecting into the cellular tissue and musculature heated paraffin of a definite melting point and moulding the parts into the desired contour during its solidification. Because of the rapid hardening of paraffin its injection is attended with mechanical difficulties. In order to prevent the paraffin from congealing in the syringe during the process of introduction, a large metal syringe should be selected and thoroughly heated by immersion in hot water, and if the paraffin is thrown rapidly through a large needle it will be kept in a sufficiently fluid state to admit of injection. The syringe filled with paraffin may be immersed in hot water just previous to its introduction. Some operators use a syringe so arranged that the barrel and piston can be kept at the desired temperature by means of an electric current.

Karewski[1] has designed and successfully employed in a large number of cases a metal syringe in which the piston and walls of the barrel are hollow and are furnished with nipples, to which are attached specially designed tubes of hard and soft rubber, so that hot water can be kept continually circulating through these hollow spaces and the paraffin kept in a proper state of fluidity. One advantage of using an instrument in which the temperature can be definitely regulated is that a small needle can be used without danger of its becoming obstructed.

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[1] Centralblatt für Chirurgie, 1902, No. 28.

There is some difference of opinion as to the most desirable consistency and melting point of the paraffin. This point deserves more consideration than any other, and in order to settle it a number of factors must be taken into consideration. A low melting point has certain advantages, viz.: The paraffin is injected with greater ease, hardens more slowly, and allows more time for moulding of the structures—and certain disadvantages—it admits of greater primary and subsequent absorption than harder paraffin, and this absorption is likely to produce thrombosis and embolism. This is an actual and not merely a theoretical danger, for a number of fatalities have already been reported.

Because of the more rapid solidification of hard paraffin, it requires greater celerity in the manipulations of moulding, and necessitates greater skill in its introduction. From the histological standpoint, hard paraffin possesses distinct advantages over softer preparations, in that the ultimate organization of the paraffin is more extensive and more perfect.

Commercial paraffin of a definite melting point may be used, or paraffin mixed with a quantity of white petrolatum in such proportions as to produce a substance having the desired melting point. Both the paraffin mixture and the apparatus must be sterilized by heat before the operation is performed. The melting point adopted by Downie[1] is 104° F.; that of Eckstein[2] is 132° to 140° F.

Comstock[3] has recently made an elaborate series of experiments upon animals in order to determine the histological changes attending paraffin injection. The preparations which he used consisted of a mixture of soft commercial paraffin having a melting point of 120° F., with white cosmoline melting at about 100° F. These two substances were mixed in such quantities as to produce samples melting at 102°, 104°, and 110° F., and were sterilized by boiling for thirty minutes over a flame, an asbestos screen being used to prevent the paraffin from burning. The mixture was then decanted so as to have it free from sediment. It should be stated that in these experiments rabbits were used and that the normal temperature of the rabbit is about 102.5° F., so that in order to obtain similar results in the human being paraffin having a melting point proportionately lower must be employed. The author recommends the use of paraffin melting at 106° to 107° F.

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[1] British Medical Journal, May 3, 1902.

[2] Centralblatt für Chirurgie, 1902, No. 26.

[3] Medical Record, November 1, 1902.

Comstock quotes from the results of Jukull, of Strasburg, in animal experiments, who found that unpleasant and even fatal results followed subcutaneous injection of one-tenth the body weight, even when the melting point of the paraffin was below the body temperature. From these observations and from his own experience he concludes that the paraffin should always have a melting point above the body temperature, and that as the toxic dose in the adult human being would be from ten to fifteen pounds, there is little danger of the administration of an overdose. He made microscopic preparations of the tissues injected with paraffin, and illustrates his article with photomicrographs of these slides. The sections demonstrate the condition of the tissues at periods from two weeks to four months after injection. Without describing in detail the characteristic histological changes that follow this operation, it may be said that the paraffin is penetrated and surrounded by connective tissue fully organized. This process of organization is most rapid and most perfect in the areas of paraffin which are thinnest, and is most extensive in the areas examined at the longest period after injection. The first impression received on microscopic inspection is that the paraffin is substituted by organized tissue, but closer inspection shows that this is not the case. The paraffin simply acts as a bridge or framework upon which is developed a connective tissue network of fine or coarse mesh. The central portion of the thickest mass of paraffin is, in some instances, not penetrated by connective tissue fibres, but the paraffin is encapsulated in rather large globules or masses. Examinations made at still later periods might show complete organization of the mass. It seems probable that absorption of the fatty constituents leaves interstices throughout the body of paraffin, which favors the ingrowth of tissue from the periphery. The above histological description applies only to cases in which hard paraffin having a melting point of 110° F. was used. The animals which were injected with soft paraffin all died within two weeks from thrombosis, so that comparisons cannot be made. When hard paraffin was employed no ill-effects were observed. A small amount of shrinkage attends solidification and organization of the paraffin mixture, which is probably due to the absorption of the fatty constituents, so that when this is used it seems desirable to slightly overcorrect the deformity. Repetition of the injection is not in any way contraindicated, and, consequently, if the contour resulting from the first injection is not satisfactory, further correction may be accomplished by subsequent injections. Certain local reactionary phenomena follow these subcutaneous injections, and the parts assume a glazed and reddened appearance. If there has been no infection these phenomena rapidly subside, and within a few days the tissues present a normal appearance.

It has been definitely determined that normally existing and artificially produced tissue spaces can be permanently filled and obliterated by paraffin, which subsequently becomes almost completely organized, and that indisputable clinical proof of successful cosmetic and functional results is furnished in numerous papers containing photographs of patients previous and subsequent to injection. In this procedure we possess an ideal method for the correction of deformities of the nose as well as of other structures. The technique is not yet perfect; revisions will no doubt be made.

Constant watchfulness may discover means of preventing some of the deleterious effects.

Carbuncle of the Lips. Under some circumstances referable to the seat and size of the lesion it may be justifiable to adopt the expectant plan in the treatment of carbuncles. But when situated upon the face or lips the mortality is so high—50 per cent.—that early operation should be resorted to as affording the greatest chances of recovery and the best cosmetic results.[1] The case reported by Wherry[2] illustrates the gravity and fatal termination of the affection, and impresses upon one the necessity for prompt and careful surgical treatment. The patient was a barber, who had extracted from his lip a "dead hair" some days before coming under observation. A few hours after this extraction the lip became swollen and manifested signs of a high grade of inflammation. The local and constitutional symptoms became progressively more intense; and when first seen he had an extensive carbuncular infection, and was evidently then suffering from pyæmia. In forty-eight hours he was dead.

Cutaneous Carcinoma of the Face. Since the announcement of the success attained by Johnson and Merrill[3] in the X-ray treatment of carcinoma there have appeared a host of other observations. Pfahler,[4] in an illustrated article, records his experience in a number of cases of facial carcinoma so treated. His technique, the one very generally adopted, consists in protecting the surrounding tissues by a lead plate and regulating the number of exposures by the immediate effect of the first few exposures upon the growth. Usually, after a few exposures, there is a marked diminution in the amount of discharge from the ulcerating surface, relief of pain, and progressive cicatrization. The cicatrix differs materially from the scar, which results in the healing of a chronic ulcer of similar proportions, in that it is thin, soft, smooth, frequently freely movable, and is described by Pfahler as only a smooth, white area in the skin. In every instance the lesion was either cured or greatly improved.

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[1] Moore, St. Paul Medical Journal, June, 1902.

[2] American Medicine, January 4, 1902.

[3] Philadelphia Medical Journal, December 8, 1900.

[4] Therapeutic Gazette, March 13, 1902.

Cleft Palate. The question of the most advantageous age at which operation for cleft palate should be undertaken has been taken up again. Lane[1] takes issue with the many surgeons who teach that only under exceptional conditions should these patients be operated upon before the third year. From his experience in operations upon a large number of patients he decides that the best results are obtained when the operation is performed in the fourth or fifth week of life, and that the sole contraindication is the existence of lowered nutrition resulting from insufficient feeding. The advantages of the early operation are: 1. The child bears the operation well. 2. But very slight subsequent discomfort is felt, and the child will take food with satisfaction within an hour or two of the operation. 3. The amount of hemorrhage is very slight and easily controlled. Where the condition is complicated by harelip he reverses the usual custom and delays operation upon the latter until union of the cleft palate is completed.

TEMPORARY CLOSURE OF THE CAROTID ARTERIES.

Extensive operations upon the head and neck are frequently attended with very severe hemorrhage, which not only increases the likelihood and degree of shock, but also makes an inspiratory pneumonia in operations in the mouth and pharynx a too common complication.

The application of the Esmarch bandage to a limb for the time required to perform an operation is not likely to cause gangrene, and Crile[2] has shown by an experimental and clinical research on the temporary closure of the carotid arteries that necrosis or gangrene of the tissues is no more likely to result in the case of the cerebrum than it is in the extremities. Without discussing the question of priority, which Dinkelspiel[3] has raised, the fact remains that Crile's paper represents a distinct advance in the surgery of the head and neck. The permanent closure of the common and internal carotid arteries has been attended with a very high mortality and with grave cerebral sequelæ. Prompted by these considerations, Crile subjected nineteen dogs to experimentation, and demonstrated that a properly adjusted clamp could be left in position, closing the artery for a period of from twenty-four to forty-eight hours without inflicting serious injury to the vessel walls. The extent of structural changes in the vessel walls was dependent upon the amount of pressure exerted by the clamp, the length of time the clamps were allowed to remain on the artery, and the presence or absence of wound infection. The immediate effect upon the circulation of temporarily closing one carotid was an increase of blood pressure, but usually compensation followed, and the pressure returned to its normal level. The respiration was not affected. When both common carotids were clamped there followed a greater rise in blood pressure, but in this case also a readjustment occurred, and the pressure soon returned to normal. In many of the experiments there was a decrease in the respiratory action, although to a very slight degree. Where the animals were allowed to recover no ill-effects were observed; the circulation was re-established without thrombosis or embolism.

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[1] Lancet, February 22, 1902.

[2] Annals of Surgery, 1902, vol. xxxvi., No. 4.

[3] Philadelphia Medical Journal, 1902, vol. x., No. 19.

The instrument used consisted of a clamp so constructed that its blades could be adjusted by a screw, approximating the walls of the artery and not compressing them. The lower blade was longer than the upper one, and its end turned up so as to hold the artery securely. Rubber tubing was stretched over the blades to lessen the risk of damage to the arterial wall. Twenty minutes previous to making the incision $\frac{1}{100}$ of a grain of atropine should be injected where the trunks of the vagi or their superior laryngeal branches are likely to be involved for the purpose of preventing possible inhibitory action upon the heart. In operations in which blood may gravitate into the respiratory tract the Trendelenburg position should be adopted. As this position partially compensates for the lowered blood pressure the patient should be restored to the horizontal position before releasing the clamps in order to avoid a rise in blood pressure above the normal. The control of arterial hemorrhage is absolute, except in such vessels as receive direct collateral pressure from the vertebral arteries. The absence of a vasomotor mechanism makes the bloodvessels of the brain more favorable for the application of this method.

Crile reports a series of eighteen operations performed between 1897 and 1901 on patients ranging in age from seven months to sixty-nine years, in ten of which both common carotids were temporarily occluded; in five, one common carotid, and in three, one external carotid. The operations were: 1. Removal of a large fibrosarcoma of the roof of the mouth. 2. Removal of a large congenital tumor of the neck. 3. Partial resection of the tongue, with removal of the floor of the mouth, the submaxillary, sublingual, and parotid glands, the superficial and deep cervical lymphatic nodes on the left side, excision of the jugular vein, and resection of the buccal aspect of the inferior maxillary bone. 4. Removal of a sarcoma of the parotid and ligation of the external carotid and the jugular. 5. Excision of the tongue, the left floor of the mouth, the middle half of the jaw, the glands of the neck, submaxillary, and a portion of the parotid glands, *en bloc*, for carcinoma. 6. Excision of a carcinoma from the parotid duct. 7. Excision of the tongue, epiglottis, left tonsil, floor of the mouth, lower jaw, submaxillary and parotid glands, left jugular vein, and left external carotid artery, and the vagus nerve. 8. Angeiosarcoma of the cheek and neck in an infant. 9. Carcinoma of the septum nasi. 10. Excision of half of the tongue, the floor of the mouth, the submaxillary, and entire chain of lymphatic glands, and of the jugular vein. 11. Removal of a carcinoma of the floor of the mouth and of the anterior part of a tonsil. 12. Excision of the upper jaw for sarcoma of the antrum. 13. Removal of a cavernous angioma of the orbit. 14. Excision of an epithelioma involving the tongue, the floor, and side of the mouth, and the tonsil. 15. Excision of a carcinomatous gland at the angle of the jaw, with removal of one-third of the lower jaw and of a primary sarcoma in front of the tonsil extending to the floor of the mouth. 16. Excision of the upper jaw for sarcoma. 17. Excision of the right superior maxilla and intermaxillary bone. 18. Removal of the left common carotid artery, the jugular vein, all overlying soft parts, the submaxillary and parotid glands, half the lower jaw, and the corresponding portion of the floor of the mouth.

In fifteen of the eighteen cases recovery was the result. In the fatal cases death occurred, respectively, from secondary hemorrhage on the thirteenth day, pneumonia on the seventh day (an alcoholic), from cerebral softening, also an alcoholic, on the tenth day. In no case could death be attributed to the temporary closure of the arteries. It was noted that a smaller amount of the anæsthetic was required to anæsthetize the patient when the arteries were closed, and less especially in the cases in which both common carotids were closed. The time required to complete the operation was lessened, the field was clearer, the amount of blood lost strikingly less, and the difficulty of keeping the blood out of the respiratory tract reduced to a minimum.

THE SALIVARY GLANDS.

Tuberculosis of the Parotid Gland. Mintz[1] reported a case of primary tuberculosis of the parotid gland in a boy, aged three years. His teeth were sound, his mouth and pharynx normal; his mother was suffering from pulmonary tuberculosis. Commencing three weeks before coming under observation, there developed a painless swelling on the left side, at first quite small, but eventually involving the entire parotid gland. As the diagnosis of a malignant tumor appeared to be confirmed by an exploratory incision, a radical operation was undertaken. This disclosed an accessory parotid, enlarged and converted into a grayish-white tumor. The secretion obtained from a fresh incision in the tumor contained tubercle bacilli. Microscopic examination revealed several histological tubercles and a small, round-celled infiltration of the interstitial tissue. It is believed to be the eighth case of primary tuberculosis on record. The microscopic findings point to the duct rather than the lymph channels as the avenue of infection. In all probability the child had been infected by his mother.

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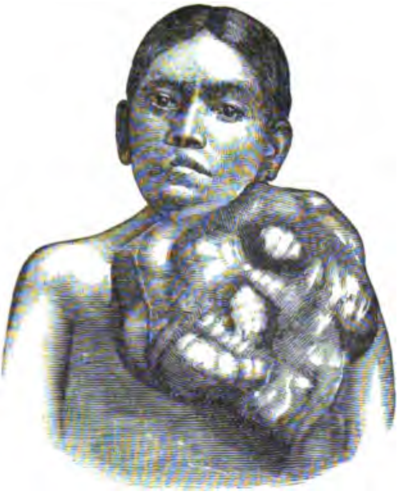
[1] Deutsche Zeitschrift f. Chirurgie, Band lxi.

Submaxillary Glands. TUBERCULOSIS OF SUBMAXILLARY GLANDS. Somewhat similar to the case of primary tuberculosis of the parotid is Lartigau's case[1] of tuberculosis of the submaxillary glands. The infection was an ascending one from the mouth to the gland along the duct.

FIG. 3.



Enchondroma of submaxillary gland.

ENCHONDROMA OF SUBMAXILLARY GLAND. Robertson[2] observed a huge enchondroma of the submaxillary gland of three years' duration. During the last two years it grew more rapidly, but was attended with neither pain, dysphagia, dyspnœa, nor interference with the movements of the tongue. The weight of the tumor was the chief inconvenience, as it kept the head fixed and inclined to the left. The growth extended from the left ear to the symphysis, and hung downward nearly to the umbilicus. It was nodulated and hard; the superficial veins over the anterior and posterior aspects were dilated. The growth was enucleated without difficulty, and the resulting wound healed by first intention. The tumor was wholly encapsulated, and measured fifteen inches in its vertical and thirty-one inches in its horizontal diameter.

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[1] Medical News, April 12, 1902.

[2] Indian Medical Gazette, March, 1902.

THE THYROID GLAND.

The Function of the Thyroid is as yet undetermined. Nefedoff experimented upon healthy dogs in the endeavor to confirm or disprove the theories of Lindermann, Cyon, Schreger, Liebermeister, Munk, and others, but obtained negative results. The injection of mucus, cocaine, and digitalin were productive of only negative results. No distinction could be detected between the action of juices from the thyroid and that of meat and lymphatic glands. In each case there was slight fever, depression, and partial or complete loss of sensation for two or three hours, but no other effect was observed.

Thyroiditis. Inflammation of the thyroid gland or thyroiditis may follow the injection treatment of goitre, and may develop as a sequel to the infectious diseases. De Quervain[1] has observed suppurative thyroiditis accompanying such diseases as scarlatina, angina, polyarthritis, rheumatica, etc. In certain cases a non-suppurative inflammation occurs without any demonstrable cause, and in these the administration of salicylate of soda has proven effective. The infectious origin of thyroiditis has been proven experimentally on dogs by injecting certain bacterial toxins and noting the proliferation of the thyroid cells that followed.

TRAUMATIC INFLAMMATION OF THE THYROID is a rare affection. Two such cases were reported by Hertle.[2] The first occurred in a woman, who had had left-sided goitre for some time; she was thrown from a carriage, and immediately swelling of the goitre, dyspnœa, and dysphagia, with bulging of the posterior wall of the pharynx, developed. An incision was made on the left side, and 500 c.c. of a dark hemorrhagic fluid escaped. A few days later the cyst was extirpated, and at the point of rupture it was found that the fluid had burrowed behind the œsophagus down into the mediastinum. The patient made an excellent recovery. The second case occurred also in a woman who fell down stairs and inflicted an injury upon a pre-existing goitre of the median lobe, and ruptured the inferior thyroid artery. This patient died from heart failure in twenty-four hours after the operation.

Enlargement of the Middle Lobe of the Thyroid. Adami's[3] case illustrates how a distinct enlargement of the middle lobe may be present and yet escape the notice of the surgeon. In his case there were periodical attacks of dyspnœa extending over a period of eight years, and terminating in death. It was mistaken for asthma, but the autopsy revealed a colloid or parenchymatous goitre of the middle lobe; the lateral lobes were atrophied and overlapped the mass on either side. A careful examination of the neck should be made whenever asthmatic attacks periodical in character occur in districts where goitre is prevalent.

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[1] American Medicine, May 3, 1902.

[2] Zeitschrift f. Heilkunde, Band xxiii., No. 3.

[3] Canada Lancet, February, 1902.

Malignant Disease of the Thyroid. According to Berry,[1] this is not difficult to diagnose, and seldom occurs before the age of forty. It is usually of steady and rapid growth, nodular, of firm consistency, though occasionally, if sarcomatous, quite soft. The papilliferous cystic tumor is a form of maligant disease running a slower course, and very suitable for operation. Unfortunately, malignant disease is seldom seen in the operable stage, and whenever operation is attempted considerable difficulty is experienced on account of its adherence to the trachea, œsophagus, and other important adjacent structures.

Classification of Goitre. The usual classification of goitre and the one given by Berry[2] recognizes the following varieties: parenchymatous, cystic, adenomatous (fœtal and cystic), fibrous, malignant, and exophthalmic goitre. Pratt[3] suggests the following classification of the benign tumors:

1. *Simple adenoma—closed vesicles filled with colloid.* The structure resembles the normal thyroid.
    - a. Colloid goitre.
    - b. Cystic goitre.
    - c. Fibrous goitre.

    } Simple adenomata that have undergone secondary changes.
2. *Fœtal adenoma.* Solid masses or rosettes of epithelial cells. Little or no colloid. The structure resembles the fœtal thyroid.
3. *Papilliferous adenoma.* Branching papillæ lying in cystic spaces:
    - a. Developing from the walls of old cysts.
    - b. True adenocystoma resembling the adenocystoma of the ovary.

Simple adenoma resembles the normal thyroid tissue in consistency and color, and its formation is due to the growth of scattered groups of embryonic thyroid cells found in the intervesicular tissue; over 90 per cent. of the thyroid tumors belong to this class. There is no doubt that some benign tumors may develop malignant properties and invade the surrounding tissues. In other instances groups of thyroid vesicles in a simple adenoma may, by the coalescence of surrounding colloid cysts, be isolated as small masses projecting into the cysts, and these on macroscopic examination only may be mistaken for papilliferous growths.

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[1] Diseases of the Thyroid Gland, London, 1901. [2] Lancet, May 3, 1902.

[3] Boston Medical and Surgical Journal, vol. cxlvii., No. 1.

Treatment of Goitre. Nothing has been added to the therapy of goitre. It is the consensus of opinion that in the event of failure following the administration of some of the favorite remedies, particularly thyroid extract, iodine, and the iodides, the treatment should consist in partial thyroidectomy. Patton[1] uses ergot, tonics, and electricity, and in the vascular varieties ligation of the thyroid arteries. In parenchymatous goitre, which is so often accompanied by chlorosis, iodine and arsenic are useful adjuvants given in connection with the extract of the thymus and thyroid glands. Scully,[2] with an experience of eighty-three cases, finds that iodine, mercury, ergot, carbolic acid, thyroidin, adrenalin, and electricity yield the best results. Iodine should be given internally in the form of the compound tincture in increasing doses, beginning with four to six drops three times daily, running the dose up to the physiological limit. The red iodide of mercury should be given by inunction, but injection of iodine or mercury into the goitre should be avoided, as it will render subsequent operation very much more difficult. Electricity is considered a valuable adjunct in the treatment of small parenchymatous goitres. Berry[3] recommends chiefly iodine and the thyroid extract. It has been frequently observed that a goitre will sometimes subside after an operation upon distant parts of the body. Thus, for example, Davis[4] reported a case of four years' duration in which, after the removal of adenoids from the vault of the pharynx, the enlargement of the thyroid disappeared.

SEQUELÆ OF THYROIDECTOMY. Among the more serious sequelæ of thyroidectomy is *tetany*. In a contribution to the surgery of tetany Westphal[5] records his experience with a case in which, two days after complete removal of the thyroid, tetany appeared. This continued for months, and was followed by paralytic seizures. The administration of thyrocodine caused rapid subsidence of the symptoms of both affections. In a second case both tetany and epilepsy followed the strumectomy. In this, as in the majority of such cases, the complications are regarded as forms of intoxication due to the absorption of injurious metabolic products.

Exophthalmic Goitre, because of its obscure origin, is perhaps the most interesting of the affections of the thyroid. Of all the theories that have been advanced none has been accepted as offering the solution of the problem relating to its pathogenesis. The discovery of the exciting etiological factors would be of the greatest assistance to the clinician in the elaboration of a proper rational course of treatment.

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[1] Clinical Review, vol. xv., No. 6.

[2] American Medicine, vol. iii., No. 20.

[3] Loc. cit.

[4] Cincinnati Lancet-Clinic, June 28, 1902.

[5] Berliner klin. Wochenschrift, 1901, No. 33.

Cervical Sympathetic. As to the part played by the cervical sympathetic in the causation of Graves' disease we may mention the recent views of Belacescue,[1] one of Jonnesco's assistants. Irritation of the sympathetic nerves will account for each and every symptom. Exophthalmos is produced by the energetic and forcible contractions of the cone of muscles known as Müller's unstriped muscle, at the posterior pole of the bulb. Excision of the cervical sympathetic will afford relief in all cases. The enlargement of the thyroid gland is caused by an enormous dilatation of the vessels dependent upon irritation of the thoracic and cervical vasodilator fibres, with inhibition of the vasoconstrictor fibres. Section of the cervical sympathetic is followed, therefore, by atrophy of the gland. Tachycardia is also attributed to the stimulation of the sympathetic accelerator fibres to the heart from the inferior ganglion. The tremor, hyperidrosis, flushes of heat, gastrointestinal disturbances, and the other numerous nervous phenomena are all of similar origin, viz., continuous stimulation of the sympathetic vasoconstrictor fibres, with a permanent cerebral anæmia. Berry[2] still holds to the older theory that exophthalmic goitre is due to a disturbance in the function of the gland, and regards resection of the cervical sympathetic as unjustifiable and founded entirely upon an erroneous view of the pathogenesis of the disease. It is both uncertain in its results and attended with certain well-recognized dangers.

TREATMENT OF EXOPHTHALMIC GOITRE. *Thyroid Feeding.* Edmunds[3] reports the results of some experiments with thyroid feeding in connection with excision of the thyroid and parathyroid glands. After complete excision of the thyroid and parathyroid glands death occurs within a few days, notwithstanding thyroid feeding. If one or more parathyroids are left the dogs survive, as a rule. If the thyroid only is left they die, as a rule. When operations are performed intended to paralyze the secretory nerves to the thyroid, if they are present, the dogs may die even though the entire thyroid system is left. After partial excision the parathyroids hypertrophy and do not change into thyroid tissue proper. The thyroid tissue may remain unaltered, even though the dog dies of athyroidic symptoms; or it may change in one of two ways: (*a*) The colloid material diminishes or disappears, the vessels dilate, and the lining membrane becomes convoluted; the structure then closely resembles if it is not actually identical with a papilloma; or (*b*) the colloid material disappears, the vesicles remain unaltered in shape, and the secretory cells proliferate and eventually fill the cavity of the vesicles, producing somewhat the appearance of a carcinoma. In the central nervous system the lesions are mainly confined to the large cells, and vary from a chromatolysis of the Nissl granules to complete destruction of the cells.

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[1] Archiv f. klin. Chirurgie, 1902, vol. lxvii.

[2] Loc. cit.

[3] Journal of Pathology and Bacteriology, 1902, vol. viii., No. 3.

Kocher's Cases. In an exhaustive article of some 304 pages, with 1423 references, Kocher[1] reviews his work at Berne since 1883. Ninety-three cases of Graves' disease are carefully reported, and the symptoms reviewed in detail. An hereditary factor was noticed in most instances, not necessarily a goitre, but some decided nervous predisposition. In every case there was some enlargement of the thyroid glands. No patient was operated upon during the stage of great psychical irritation or acceleration of the pulse. Of the fifty-nine cases operated upon, 76 per cent. were cured, 14 per cent. markedly improved, 3.3 per cent. slightly improved, and four cases, or 6.7 per cent., died. The deaths were due to bilateral croupous pneumonia, embolism of the artery of the Sylvian fossa, heart failure, and thyroid intoxication. The results obtained in fifteen cases treated by internal medication were inferior to those following operation. The operations consisted of either partial excision or ligature of the thyroid arteries or both combined. In only three cases was the cervical sympathetic resected, and even in these the arteries were ligated.

Sympathectomy. Jonnesco and Belacescue, on the other hand, consider bilateral resection of the sympathetic the method of choice in all cases of Graves' disease. Belacescue[2] reports 63.8 per cent. of permanent recoveries, 18.1 per cent. of cases improved, and 18.1 per cent. of failures without a single death. Jonnesco[3] has followed the course of eight patients for eighty days to six and one-half years after resection of the cervical sympathetic. No trophic disturbance was noted in any cases, and neither the physical nor the mental development of the patient were affected. Contraction of the pupils, drooping of the upper lid, and congestion of the conjunctiva of the eyeball, gums, and brain persisted after the operation, while the influence of nutrition, hyperæsthesia, difficulties in mastication and deglutition and decrease in the tension were only transitory.

The various operations on the cervical sympathetic for the relief of Graves' disease are: 1. Simple division. 2. Ablation of the nerves by Jaboulay's operation; the nerve is stretched and twisted by means of forceps attached to its upper and lower ends. 3. Simple stretching of the nerve. 4. Partial resection. 5. Partial and extensive resection. 6. Total resection. Belacescue[4] considers that total and bilateral resection of the cervical sympathetic is the most effective operation and one easily performed if the operator is familiar with the anatomical relations of the nerves. The vertebral artery and vein, the jugular vein, carotids, and vagus are easily avoided, and the pleural cavity need never be opened.

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[1] Mittheilungen aus den Grenzgebieten der Med. und Chirurgie, Band ix., Heft 1 und 2.

[2] Archiv f. klin. Chirurgie, 1902, vol. lxviii.

[3] Bull. Acad. de Méd., July 1, 1902.

[4] Arch. f. klin. Chirurg., 1902, vol. lxvii.

Jonnesco[1] has performed over one hundred and thirty bilateral cervical sympathectomies during the past five years. The simplest of his operations involved the removal only of the superior ganglion, a feat which in the living subject has been declared anatomically impossible. In none of these cases has there been the slightest evidence of trophic or circulatory disturbance. His subjects included about one hundred epileptics, fifteen suffering from exophthalmic goitre, twelve with symptoms of glaucoma, and two cases of essential migraine. Of the series of fifteen patients operated upon for Graves' disease they were all either completely cured or very much improved. The general condition was so modified that disturbances of nutrition disappeared and the nervous condition restored to its original stability. The prominent eyeballs, the goitre, and the tachycardia disappeared completely. The relief from digestive disturbances, from which these patients so frequently suffer, may account for the improvement in nutrition and general health which followed. Of the twenty-nine *epileptics* subjected to this operation, twelve were cured, four greatly improved, and the rest unimproved. The rationale of the operation is founded upon the hypothesis that epileptic seizures are due to cerebral anæmia.

As to the results in the cases of *glaucoma*, though complete restoration of vision is not anticipated, the disease will be arrested and pain relieved.

Accessory Thyroids are often of service in preventing cachexia strumapriva when complete thyroidectomy has been performed. They are analogous to the accessory spleens, and are found in various localities, usually in front of the larynx, between the upper border of the isthmus and the hyoid bone, above and below the superior and inferior horns, near the posterior border of the lateral lobe, lying upon the pharynx or œsophagus, and occasionally at the base of the tongue or within the larynx, trachea, pleuræ, or mediastinum.

Shurley[2] reports a growth in the pharynx which presented the appearance of an accessory thyroid gland, and the removal was followed by myxœdema. Wells[3] has observed a case of accessory thyroid in the interior of the larynx, portions of which were removed through the mouth. Smith[1] operated successfully by the transhyoid route upon an accessory thyroid tumor at the base of the tongue. Reviewing twenty cases now on record he finds that this accessory thyroid is situated back of the circumvallate papillæ, and extends in the median line to the epiglottis. In many instances the posterior wall of the pharynx has been invaded. About 1 to 8 cm. in diameter, they are smooth, firm, and covered with a pale mucous membrane elevated upon a broad base. The symptoms depend altogether upon the degree of pressure; dysphagia, dyspnœa, interference with speech, and hemorrhage (25 per cent.) have all been noticed. This latter symptom has been confused with an hæmatemesis, upon which was based the diagnosis of gastric ulcer. The treatment consists in extraction of the growth either through the mouth, by the electrocautery, or by a superior pharynxotomy, with division of the hyoid, perhaps after division of the inferior maxilla, or by Kocher's method for excision of the tongue. In Smith's case he divided the hyoid bone and split the floor of the mouth beneath the jaw.

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[1] International Clinics, twelfth series, 1902, vol. xxi.

[2] American Medicine, June 27, 1902.

[3] American Laryngology, Rhinology, and Otology Society, June, 1902.

Teweles[2] observed a tumor at the root of the tongue, 5 cm. in diameter, in a girl, aged thirteen years, the structure of which resembled the thyroid gland.

Curtis and Gaudier[3] also report a case of accessory thyroid at the base of the tongue covered with mucous membrane and seemingly extending into the muscle. It gave rise to no glandular enlargement, but caused dysphagia and alteration of the voice. It was extracted through the mouth, and found to be a colloid goitre. Theisen's[4] case was one of intratracheal colloid struma attended with marked dyspnœa and cyanosis in a woman five months pregnant. She had a goitre of moderate size, with an enlarged isthmus. Laryngoscopic examination revealed a tumor springing from the posterior and left lateral walls of the trachea, regular in outline, and covered with smooth mucous membrane. The increasing dyspnœa made operation imperative; a high tracheotomy was first performed, the isthmus pushed down, ligated with catgut, and divided. This afforded perfect exposure of the trachea, and a low tracheotomy was performed. The tumor was over 5 cm. long, and extended from the first tracheal ring downward along the posterior wall, and almost filled the tracheal lumen. It was resilient to the touch, firmly attached by a broad base to the trachea, and seemingly formed part of the wall. As much of the growth as possible was removed with snare and curette. Hemorrhage during the operation was controlled by the use of a sterile solution of adrenalin chloride, 1:1000. The trachea was united with catgut and the external wound with silkworm-gut, leaving the tracheotomy tube *in situ.* On the fourth day after operation the patient developed a double pneumonia, but recovered from this, and was discharged from the hospital wearing a tracheotomy tube. The tumor proved to be a colloid goitre. Theisen says his case is the tenth on record and the second reported in the United States. He describes the previously recorded cases, rejects some doubtful ones, and goes over the theories regarding the formation of accessory thyroids, including the embryonic theory (Bruns and Heise), and the theory designating them offshoots of the thyroid gland (Paltauf). In the latter the thyroid tissue is supposed to penetrate through the interstitial membrane to the perichondrium and submucosa on the inner surface of the trachea without any resulting perforation or defect of the tracheal wall. This penetration is claimed to be the result of the firm adhesion of the right and left lateral lobes to the upper tracheal rings and cricoid. This must take place during the development of the fœtus, but the penetration of thyroid tube probably did not take place until puberty. Theisen concludes his article with the following statements:

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[1] Nord. Medicin Arkiv., 1902, vol. xxv., Heft 2, No. 10.

[2] Wiener klin. Wochenschrift, February 20, 1902.

[3] Revue de Laryngologie, d'Otologie et de Rhinologie, 1902, No. 15.

[4] American Journal of the Medical Sciences, June, 1902.

1. That cases of intratracheal struma are, perhaps, not so rare as the few cases on record would indicate. If laryngeal, and, as far as possible, tracheal examinations of all cases of goitre were made, particularly when the thyroid is only slightly enlarged and the dyspnœa is severe, more cases would probably be discovered. 2. The term accessory when applied to such tumors is not correct, because they are really "offshoots" of the thyroid gland. 3. Pregnancy, as in the writer's case, undoubtedly has a great influence on the development of intratracheal struma.

Parathyroids are small glandular masses situated usually posterior to the thyroid gland. Their function is evidently different from that of the thyroid gland, and they lack the colloid material found in the accessory thyroids. Toretta has made an interesting study of these structures, and reports four cases, in two of which the glands were external and in two internal to the gland. As their blood supply is received from the thyroid arteries they become functionally inactive after strumectomy. In his cases the internal parathyroids were in close relation with the thyroid gland, and the external with the thymus gland.

An exceedingly dangerous form of thyroid enlargement is that in which the goitre extends down behind the sternum (the struma occulta of Kocher). It is difficult to recognize, equally difficult to remove, is usually large and cystic, and gives rise to marked pressure symptoms.

THORACIC DUCT.

While dissecting out the lymphatic glands during a radical operation for carcinoma of the breast, Schopf[1] injured the thoracic duct. The breast was removed and the axilla dissected free of fat and glands without any difficulty, but in removing the supraclavicular glands they were found so tightly adherent to the internal jugular vein as to necessitate ligation and partial excision. The thoracic duct was evidently injured because a *chylorrhœa* developed, and fifteen days after the operation the patient became dyspnœic and died the following day. The autopsy revealed a chylothorax, with compression of the lung.

Schopf has found records of nineteen accidents of this kind. As chyle does not clot, chylorrhœa follows, and if this is not checked the patient becomes progressively weaker and emaciated on account of the partial arrest of fat absorption. When the thoracic duct is obliterated by pressure the chyle is taken up by the venous capillaries or accumulates in the pleural (chylothorax) or peritoneal (chylous ascites) cavity. A case of this kind was observed by Pagenstecher[2] in a child, aged nineteen weeks, in whom the abdomen had been increasing in size since the child was but three weeks old. Paracentesis was followed by the escape of 2300 c.c. of a milky fluid. Two and one-half weeks later the abdomen was opened and 1500 c.c. of chylous fluid evacuated. No perforation, rupture, or anomaly of the duct could be found, and it was concluded that the chylous ascites was due to stasis. The child recovered.

THE ŒSOPHAGUS.

Foreign Bodies in the Œsophagus. The diagnosis of foreign bodies in the œsophagus can be made in most cases by exposure to the Röntgen ray, although in some instances the presence of the heart shadow or the shadow of the vertebral column has interfered somewhat with accurate localization. Killian[3] refers to a case in which the Röntgen ray failed to reveal the shadow of a vulcanite tooth plate which had been swallowed by a woman, aged fifty-two years. Eight weeks later a skiagraph was taken, with negative results, but with a probe the foreign body could be felt in the œsophagus. Attempts to remove or dislodge it were unsuccessful. An examination with the œsophagoscope was made and the foreign body found impacted in the œsophagus at a distance of 35 cm. from the upper incisors, and, therefore, near the cardia. An attempt was made to extract the plate by means of tubular forceps, but as the resistance offered was so great, injury of the œsophageal wall was feared, and the attempt was abandoned. By means of a galvanic snare the plate, after several attempts, was cut in two. The snare was introduced with a small loop only at the side of the plate, the loop then enlarged and by manipulation the foreign body was caught and divided with incandescent wire and the pieces easily removed with forceps. Killian prefers œsophagoscopy to either the X-ray or the probe, and uses a straight tube small enough in calibre to pass through the rima glottidis. By this means the œsophagus may be systematically searched from above downward, and the exact location and form of the foreign body and its relation to the wall recognized. Local anæsthesia with a 2 to 5 per cent. alcoholic solution of cocaine and a preliminary injection of morphine is sufficient to allay pain, though in children and excitable patients a general anæsthesia may be necessary. If the body is deeper than 24 or 26 cm. from the upper incisors it will be necessary to resort to a gastrostomy or posterior mediastinotomy.

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[1] Wiener klin. Wochenschrift, November 28, 1901.

[2] Deutsche Archiv f. klin. Med., Band lxxii, Heft 2, p. 104.

[3] British Medical Journal, August 30, 1902.

McIntyre[1] describes an *electro-œsophageal probe* constructed on the telephone principle, so that simple contact with the body is sufficient to demonstrate its presence. To a certain extent it resembles Duplay's œsophageal resonator, but the detection of the body with this instrument depends upon the latter striking audibly against the foreign body.

The Œsophagoscope. Since the introduction of the œsophagoscope the diagnosis and treatment of affections of the œsophagus have been simplified in the opinion of some to a very marked degree. Gottstein[2] has done a great deal to popularize this instrument, and has contributed a very interesting article upon the technique of œsophagoscopy, containing the results which he obtained.

The use of the instrument is contraindicated in acute and inflammatory conditions on account of the danger of perforating the œsophageal wall, but in cases of suspected chronic inflammation it is of the greatest assistance as a diagnostic agent, particularly in the excluding of carcinoma. Catarrhal erosions and fissures, gummata, actinomycosis and spasm of the cardia, with secondary dilatation of the œsophagus, in one of which carcinoma developed above the dilatation, atony, paresis and paralysis of the œsophagus, hysterical hyperæsthesia of the œsophagus, have been recognized and diagnosed by Gottstein through the aid of the œsophagoscope. Though the diagnosis of cicatricial stenosis can be established from the history, and by the passage of a sound, more effective treatment can be carried out with the œsophagoscope. In cases of malignant stenosis Gottstein hopes that by the earlier recognition of malignant disease through the œsophagoscope a radical cure by resection may be possible. He has used the œsophagoscope to great advantage in the diagnosis of tumors and aneurisms pressing upon the wall of the œsophagus. He refers to an operation, daring as it was original, performed by Mikulicz, in which the entire œsophagus was removed through a wound in the stomach. The attachment of the cardia was severed and the communication with the stomach closed; the œsophagus was then exposed and severed through a wound in the neck; a sound to which the upper part of the œsophagus was fastened was passed through the œsophageal opening in the diaphragm, and the entire œsophagus removed. A gastric fistula was established. Death ensued twenty-four hours later.

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[1] British Medical Journal, August 30, 1902, p. 572.

[2] Mittenden Grenzgebeiten d. Med. und Chir., Band viii., Heft 1, 2, 4, and 5.

Congenital Absence of the Œsophagus. A case of congenital absence of the entire œsophagus, now the fifth case on record, is described by Marsh.[1] The symptoms in all of these cases are very similar. Nothing unusual is noted until the child begins to nurse. After taking a mouthful of milk the child in attempting to swallow is seized with symptoms of strangulation, and with a supreme effort ejects the fluid through the nose and mouth. Suffocation seems imminent, but, as a rule, the child recovers until the next attempt at nursing is made, when this history repeats itself. The amount of bowel evacuations and the amount of urine diminish; the child rapidly grows emaciated, and finally dies of starvation. Toward the end inspiration pneumonia develops in quite a large proportion of cases. The diagnosis can be confirmed by measuring the quantity of milk given or by the passage of a small catheter. The prognosis is absolutely unfavorable. Gastrostomy holds out the only hope of relief, which, of course, would be only temporary.

Idiopathic Dilatation of the Œsophagus. This is, according to Rosenheim,[2] a more common affection than is usually supposed. He has observed nine cases himself, and has collected over a hundred more from the literature. Most of his patients were young men, and in most cases the dilatation was due originally to trauma, either a blow on the chest or the ingestion of too hot liquids or too large mouthfuls. Some disturbance of the neuromuscular apparatus results, and the lesion begins with ill-defined gastric symptoms which may exist for years before the attention is directed to the œsophagus. By this time the lesion will have become inoperable. The passage of a sound, the absence of hydrochloric acid in the food removed from the dilated œsophagus, and the absence of the products of digestion, the use of the œsophagoscope and the X-ray aid one in making a diagnosis. The prognosis in cases with large sacs is unfavorable; but if the disease is not of long standing a good deal of improvement may be hoped for. As to the treatment, the œsophagus should be washed out regularly with a ½ : 1000 to 1 : 1000 argentic nitrate or carbon dioxide solution. In cases of cardiospasm it is dangerous to exert much force in attempting to pass the sound; the treatment should consist rather in rest in bed, opium, and a carefully regulated diet, or for a few days nutritive enemata. In severe cases gastrostomy may be required.

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[1] American Journal of the Medical Sciences, vol. cxxiv., No. 2, p. 304.

[2] Berliner klin. Wochenschrift, March 31, 1902.

Cicatricial Stenosis of the Œsophagus. Among the suggestions for the treatment of cicatricial stenosis of the œsophagus is one by Tauber,[1] who reports two cures following gastrostomy. The anchoring of the stomach to the abdominal wall is supposed to make sufficient traction upon the œsophagus to stretch or elongate the cicatricial tissue. A gastropexy might accomplish the same results.

Escher,[2] for the relief of cicatricial occlusion at the level of the fourth tracheal ring, performed œsophagotomy and resected 1.5 cm. of the œsophagus. The divided ends were sutured and united by first intention. Four months later there was no evidence of recurrent stenosis. A similar operation was performed by Braun[3] upon an œsophageal stricture immediately below the level of the larynx. The cicatricial tissue was excised and the ends of the œsophagus approximated with a circular catgut suture. A rubber drainage tube was passed into the œsophagus through a linear incision and thence to the stomach. The wound was packed with iodoform gauze and healed by second intention. The œsophageal fistula was closed at a subsequent operation.

THIOSINAMIN[4] has been used by Teleky[5] in a number of cases of cicatricial stenosis. It is said to soften the cicatricial tissue by favoring the flow of lymph, especially in the newly formed tissue. It is claimed that in one case undergoing treatment for cicatricial stenosis of the œsophagus, the cicatrix of an old gastrostomy became absorbed under the influence of thiosinamin, so that the stomach was set free from its attachment to the abdominal wall. The results in some cases were surprisingly good, while in others they were the reverse. I have never seen an instance of this alleged influence of thiosinamin upon cicatricial tissue, nor have any such results been attained by my assistants.

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[1] Wozenno Medical Journal, January, 1902.

[2] Centralblatt f. Chirurgie, 1902, No. 8.

[3] Deutsche Zeitschrift f. Chir., Band lxi. p. 511.

[4] PROGRESSIVE MEDICINE, December, 1902, p. 395.

[5] Wiener klin. Wochenschrift, February 20, 1902.

Malignant Stricture of the Œsophagus. Symonds,[1] in a very comprehensive paper upon this subject, says: "The diagnosis of malignant œsophageal stricture resolves itself into passage of a bougie to ascertain the presence of depression and treatment in deciding the best way of introducing food." So many cases, however, are treated for dyspepsia that the early symptoms are worth consideration. The gradual increasing of dysphagia is a common history in most cases. In a number of cases the onset is sudden. As an aid to diagnosis the patient should be instructed to swallow liquid. The patient makes the ordinary efforts, followed by one or two smaller ones. These are accompanied with certain peculiar movements of the neck. He brings up a little gas, often hits his chest, and says the fluid is swallowed. Kussmaul's sign of listening at the back to hear the fluid arrested by the stricture, and then trickle through, is interesting, and, when the bougie is not passed sometimes valuable. The danger of the bougie, he thinks, is overestimated, though there is some risk in using a fine bougie, particularly in advanced cases. The three situations in which malignant disease may occur are the upper third and cricoid orifice, the lower end and gastric orifice, and the central region. The first, in the cricoid region or beginning just below the ring, is, in his experience, always malignant. It begins eight or nine inches from the teeth and involves two or three inches; the chief peculiarity is its tendency to cicatrize and contract. The contraction is irregular. In the diagnosis of malignant disease of this situation he has found four conditions giving rise to confusion: 1. Dysphagia occurring in elderly people, which, he thinks, may be possibly due to excessive cricoid ossification or some bony outgrowth. 2. Spasmodic stricture, especially in men. 3. A pharyngeal pouch. When well marked the symptoms are so well defined as to clear up quickly this difficulty. 4. Malignant disease of the lower end of the pharynx involving the arytenoids. The main symptoms are pain in swallowing, a peculiar alteration of the voice, and the presence of a growth. Women are afflicted more frequently than men. Though in the middle third, in exceptional cases the growth may be a sarcoma or a myoma, usually it is a carcinoma.

Aneurism and mediastinal growths rarely give rise to serious dysphagia. An œsophageal pouch in the middle or lower section is sometimes difficult to detect. The lower end of the œsophagus, a point from 15½ to 17 inches from the teeth, is, in Symonds' experience, the only locality where we find a simple obstruction. The mechanical difficulty being overcome, the future is more hopeful than that of obstruction in any other situation. He disbelieves in spasmodic stricture so-called, aside from hysterical cases. He summarizes the diagnosis of œsophageal obstruction in the following: 1. Among early symptoms we may have so-called dyspepsia, nausea, and repulsion for food; pain alone when the central district is affected. 2. The passage of a bougie is the only way to clear up the case, and its employment need not be feared. 3. Extra-œsophageal disease rarely gives rise to serious dysphagia. 4. Spasmodic obstruction, apart from the hysterical form, has always, when decided, an organic cause, and this would be better called intermittent dysphagia. 5. With regard to the three special districts it may be said (*a*) that all organic obstruction in the upper third is malignant and has a special tendency to cicatrize; (*b*) that in the central half of the gullet a sarcoma or myoma, both rare diseases, may cause fatal obstruction, and here also a pouch may give rise to difficulty in diagnosis, but can generally be excluded; and (*c*) that in the lower end alone does simple stenosis occur, and here there may be difficulty in distinguishing from cancer of the stomach, causing great reduction of the cavity (leather-bottle stomach). 6. Finally, in estimating the extent of the disease, the special value of the steel bulb is noted and also the use of the acorn bougie in obstruction at the lower end.

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[1] Lancet, August 9, 1901.

In regard to the treatment the following general principles should be observed: 1. While the patient can swallow fluids and semifluids, and while a bougie can be passed and plenty of nourishment taken, he may be left alone so long as (*a*) he can swallow well, or (*b*) a small bougie, a No. 12 catheter, can be passed. 2. If the dysphagia increases, even though a bougie can be passed, then a tube must be inserted or gastrostomy must be performed. These conditions are seen in the soft fungating forms. 3. If a bougie cannot be passed or enters with difficulty, then the same course must be followed, as we know that complete closure may occur at any time. 4. If both conditions arise—*i. e.*, the patient cannot swallow and a bougie cannot be passed—then immediate mechanical treatment is required.

He is opposed to passage of a bougie with a view toward dilating the stricture because it simply irritates the lesion, and sometimes is followed by more rapid growth of the neoplasm and greater obstruction. He treats strictures of the upper third at first by the insertion of a long rubber tube, and finally by gastrostomy, because of the tendency to rapid closure and of the certainty of complete obstruction sooner or later. The long rubber tube is best made from rubber drainage tubes introduced with a whalebone director; a silk web tube may be passed in for the first few days in order to dilate the passage—the rubber tube lasts a long time, nine months in one instance, and when it loses its elasticity a fresh piece may be inserted. He has found it difficult to treat cases of disease of the lower end of the œsophagus with tubes.

Early gastrostomy in these cases seems to him the best advice. It may be possible, especially with the Coudé bougie, to dilate the obstruction if the gullet has had a rest, and we may anticipate some improvement in the swallowing.

In obstruction of the cardiac end gastrostomy should be performed early, and in all patients intolerant to the tube and bougie time should not be wasted. In many cases, however, we will have to use the alternative method of tubage. As regards cricoid strictures and diseases of the lower part of the pharynx he is quite satisfied with the rubber tube. The short tube is useful in stricture, occurring ten to fourteen inches from the teeth. It has no advantage where there are any indications of perforation, and it is of little value when the growth occupies a long stretch of the gullet. It is seldom useful in stricture involving the cardiac orifice, and cannot, as a rule, be borne in disease involving the cricoid level, and if a gastrostomy is decided upon, it should be performed early. In disease of the central portion the short tube is serviceable in a number of cases.

Sarcoma of the Œsophagus. In reviewing the records of twelve hitherto recorded cases of sarcoma of the œsophagus, in connection with an additional case under his own observation, having metastasis in the stomach and neighboring lymph glands, Howard[1] finds that the disease is more common in males than in females, and at the period of life during which carcinoma most frequently occurs. It may, however, unlike carcinoma, occur in early life, between the fourth and twenty-fifth year. Nine of the twelve cases involved the lower half of the organ. The tumors, as a rule, nearly surround the lumen, but in three cases they formed pedunculated or polypoid masses projecting into the lumen, with symptoms of œsophageal obstruction in eleven of twelve cases. There was perforation with involvement of the respiratory organs in four cases. All varieties of sarcoma except angiosarcoma have been found, the round-cell variety standing first in frequency—one-fourth of the cases. Metastases occur rather frequently (five out of twelve cases), and in two cases were widespread. The clinical diagnosis of œsophageal sarcoma has not been made, and there are no certain and constant diagnostic points between sarcoma and carcinoma of this organ, the clinical symptoms being necessarily very much the same and dependent upon the same conditions—obstruction and cachexia—in the two diseases. As pointed out by both Livingood and Stark, sarcoma runs a more rapid course, and a fatal issue is to be looked for earlier than in carcinoma. The greater size of the sarcomatous growths is probably responsible for this. The differences in the character, distribution, appearance, and duration of the pain in the two affections described by Stark are not mentioned by other observers.

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[1] Journal of American Medical Association, February 8, 1902, p. 392.

Ulcer of the Œsophagus. Pulmonary tuberculosis has frequently been mistaken for ulcer of the œsophagus when there has been a history of the patient having vomited bright red or arterial blood. In such cases the possibility of the existence of an ulcer should be borne in mind and the presence or absence determined by the use of the œsophagoscope. Knapp[1] has reported five cases in which this mistake had been made.

AFFECTIONS OF THE FEMALE BREAST.

Mammary Carcinoma. The different methods now employed for excision of the breast differ chiefly as to the extent to which one should remove the pectoral muscles, and the lymph glands, and the lymph ducts which drain the mammary gland. All operators make their primary incision wide of the tumor, and modify the incision according to the site and extent of the growth. The entire mammary gland, together with any infiltrated pectoral fascia or muscle, is removed in every case of certain or suspicious malignant growth. Many operators as a routine remove one or both pectoral muscles. Nearly all remove the axillary lymph glands and the mammary gland *en masse.* The supraclavicular and infraclavicular lymph glands are removed by some surgeons only when palpably enlarged; by others as a routine procedure. In other words, the average excision of the breast as performed to-day implies the removal of the gland and the tumor, together with a liberal section of the surrounding healthy tissue and the chain of axillary lymph glands to such an extent as may be warranted by the condition of the patient, and, without endangering the life of the patient or injury of important structures, the removal of such other lymphatic chains, such as the supraclavicular and infraclavicular and the posterior cervical as may seem to be involved. It would seem that with the execution of Halsted's proposition, viz., that with removal of the mediastinal glands, the limit of operative interference will have been reached. Better results in the treatment of mammary carcinoma will depend upon earlier recognition and earlier operation.

Du Bose,[2] with reference to the increase of cancer, offers statistics which would seem to prove that in the United States, England, and Wales, during a period of twenty years, from 1870 to 1890, there was an increase of over 100 per cent., and in Philadelphia an increase of 179 per cent. from 1860 to 1900.

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[1] Medical Record, March 1, 1902, p. 334.

[2] Mobile Medical and Surgical Journal, June, 1902.

The various steps of the operation may be considered to advantage with relation to the immediate and ultimate results. As to the amount of surrounding tissue to be included in the incision, the statistics of Lebhard,[1] which cover a series of over two thousand cases of late recurrence—*i. e.*, recurrence after three years—show that 75 per cent. recur in the scar or the tissues in its immediate vicinity. Bryant reports this form of recurrence in 14 of 21 cases. According to Lebhard, these recurrences are due to the failure to remove some carcinoma cells which become incorporated in the cicatricial tissue; because of the nature of the tissue their proliferation is for a time inhibited, but through the agency of certain obscure influences proliferation is renewed and new carcinomatous foci develop. Late recurrences in lymph glands owe their origin to those carcinomatous cells which have been left unintentionally in the skin at the time of operation. In order to differentiate between true metastasis and a second and independent carcinoma in the internal organs, in the primary unaffected breast, or in other structures, one must compare the microscopic findings; the metastatic tissue should always resemble the primary tumor. The excellent results of Shield, who reports sixty operations in which the incision was made wide of the tumor, and a remarkably low percentage of recurrences, may be cited as demonstrating the expediency of this procedure. A defect, no matter how large, resulting from inability to perfectly coapt the edges of the wound can be repaired by primary or secondary skin grafting.

Gobell[2] records his experience with two cases in which he covered the large deficit resulting from extensive removal by a modification of the so-called autoplastic method as carried out by H. Graeve, Delbert, Leguen, and Felix Franke. This consists in freeing the unaffected breast, together with its integument, from the pectoral fascia and sliding it over to cover the defect. Starting at the lower border of the existing wound, the incision passes under the opposite breast as far as the anterior axillary line; after freeing the attachments of the gland to the pectoral fascia the flap is carried toward the affected side and sutured to a flap so fashioned from tissues of the back as to cover the axillary portion of the wound. The small angular skin defects that remain are covered by skin grafts. Union occurred without the sloughing of the pedicles of the flap, and the results were regarded as quite satisfactory. The transplanted breast occupies a position about in the median line.

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[1] Beiträge z. klin. Chirurgie, 1902, Band xxxiii., Heft 3.

[2] Deutsche Zeitschrift f. klin. Chirurgie, 1902, Band lxiv. p. 144.

This differs from previous operations of a similar nature in that, instead of removing the mammary gland from the flap and using only the skin to cover the defect, all the structures are retained in the flap. By this modification a better blood supply for the flap is procured and the liability of subsequent sloughing diminished.

The influence of the removal of a portion or of all of one or both pectoral muscles upon the frequency of occurrence is as yet only conjectural, since too little time has elapsed since the adoption of the procedure to warrant an expression of opinion. A number of operators have reported favorable results following the removal only of such portions of the muscles as were demonstrably involved. There is, however, an ever-growing tendency on the part of American surgeons to adopt the more radical procedure. The chief objections to the removal of the pectorals, viz., that it lengthens the operation and interferes with the function of the arm, are well answered by Drew.[1] The additional time consumed in removing the pectoralis minor, he claims, is more than compensated for by the time saved in dissecting out the axillary glands, in that a freer exposure renders the glands more accessible. As to alleged disturbance of function, the pectoralis minor, attached as it is to the subcoracoid process, plays practically no part in the movements of the arm. He has removed both muscles in all his recent operations, and has been surprised at the slight inconvenience resulting; "in many cases it does not appear to be greater than when the muscles have been left intact." He suggests what seems to me a very rational explanation of this, namely, that in the majority of cases in which the pectoral muscles have not been removed, the nerve supply has been cut off. If it is important to preserve these muscles it is equally important to leave intact the anterior thoracic nerves which supply them; "in what proportion of the cases operated upon without removal of the pectorals do these nerves escape injury where no precautions are taken to insure their safety and when the procedure of clearing out the axilla is thoroughly performed?" In his own experience he has found it exceedingly difficult to avoid injuring these during his dissection in the axilla. If the pectoral muscles are left intact every endeavor must be made to remove in their continuity the lymph vessels leading from the mammary gland to the axillary lymph glands. If a small section of carcinomatous lymph vessel be left in the wound it will serve as a nucleus for recurrence.

Recurrence. Among the recently published statistics concerning recurrence after removal of mammary carcinomata are a number of considerable interest. Bryant adds to his previously published figures an analytical table of a number of cases. He reports 17 cases with no recurrence for five years or more. In 28 recurrences the period of freedom was: 1 case, twenty-four years; 1 case, twenty-three years; 7 cases, ten to thirteen years; 2 cases, ten years; 9 cases, three to seven years; 1 case, three years; 4 cases, two years; 3 cases, one year. The most instructive and reliable statistics are those which are based upon the observance and experience from the clinic of an individual operator covering a period of many years. Of such a character are the statistics tabulated by von Guleke,[1] comprising 884 cases of mammary carcinoma treated in the surgical clinic of Prof. von Bergmann from October, 1882, to December, 1899. The total number of operable cases was 835, and the total number of operations 943. As to the etiology of the primary growth, age and heredity are considered of the most importance; to be added to these are the sexual habits of the subject and previous inflammatory conditions of the breast, and, of lesser significance, lactation and trauma. The site of predilection was the outer upper quadrant; the order of frequency then being the outer lower quadrant, the inner upper quadrant, the inner lower quadrant. The most frequent variety was the scirrhus. The rapidity with which metastasis occurred varied according to whether the tumor was or was not richly endowed with carcinoma cells. On an average involvement of the axillary glands was noted in 11.6 months; adherence of skin in 12.15 months; adherence to the deep structures in 13.9 months; and superficial ulceration in 16.45 months; and involvement of the supraclavicular lymph glands 19 months after the detection of the tumor. The infraclavicular glands were affected independently of the axillary by direct extension from the mamma. Metastasis (noted in 128 cases) occurred most frequently in the liver; in other structures in the following order of frequency: the mamma, lung, pleura, stomach, vertebræ, sternum, cranial vault, brain, femur, humerus, bronchial glands, pericardium, kidney, inguinal glands, peritoneum, pelvis, and eye. In 41.3 per cent. of cases recurrence took place within six months of the operation; in 1 case at the expiration of eight years. Many cases have enjoyed freedom from recurrence for periods of fifteen to eighteen years. Of 382 cases, 110, or 28.7 per cent., have remained free from recurrence for a period of three years or longer, and of those 110 only 29 had any glandular involvement. In 81 there was involvement of axillary glands; in 53 adhesion to the skin; in 13 adhesion to the pectoral muscle, and in 12 ulceration of the skin.

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[1] British Medical Journal, May 17, 1902.

These statistics confirm the observations hitherto recorded, that of the various forms of carcinomata the most frequent and yet the least malignant — scirrhus — furnishes the largest number of late recurrences.

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[1] Wiener klin. Wochenschrift, January 22, 1902.

INOPERABLE CANCER. Morris,[1] in a discussion before the British Medical Association expresses his opinion of the relative merits of the various measures applicable to the treatment of inoperable cancer (such as Berger's interscapulothoracic amputation and amputation through the shoulder-joint or just below the trochanters), in those cases in which the arm is enormously swollen, continuously painful, and functionless. In cases with intense pain from pressure and involvement of the nerve trunks, but when the arm is not greatly enlarged, heavy and cumbersome, relief may be afforded by division of the brachial plexus. To quote from an editorial comment upon this discussion in the *British Medical Journal*, the general impression left by the discussion is certainly that in each of the chief methods mentioned there is something which under certain conditions and in certain cases is helpful, but that further research and further clinical investigation are required before any real benefit can be predicted or anticipated in any given case, and that the whole discussion has proved of great value in ventilating the subject and in giving an opportunity of recognizing the position of a matter which is almost without a rival in importance.

Oöphorectomy. As confirmatory of the beneficial results to be derived from oöphorectomy in inoperable carcinoma of the breast, Simmons[2] reports a case of an extensive, infiltrating, ulcerated carcinoma of over four years' duration, which was completely healed eleven weeks after the performance of a double oöphorectomy. No microscopic examination was made, but the history, development, and appearance of the growth seemed, however, to justify the diagnosis; at the time of operation there was one ulcerated area, measuring four and one-half by three and one-half inches, and there were several firm nodules in the margin of the ulcerated area. The axillary lymph glands were not palpable, but the usefulness of the arm was much impaired. There were evidences of active reparation of the defect in the fourth week, and by the eleventh week the site of the previously existing ulcer was completely covered by a firm, smooth cicatrix. This condition still obtained some months after the operation, and the function of the arm was almost completely restored. The recovery can hardly be considered as perfect since the subcutaneous nodules were still present, although they were reported as being smaller, softer, freely movable, and apparently undergoing absorption. Buthin,[3] on the contrary, goes so far as to state that he does not know of a single case of cancer of the breast in which it has been proved that a patient has been cured by oöphorectomy. When the growth reappears, as usually happens, from a few months to a year, it has all the characteristics of the original tumor, and the subsequent course will be precisely the same as though no operative intervention had been employed. Shield believes the beneficial results to be due to the diminished vascularity of the mammary region; he never performs the operation without first warning the family of the possible development of masculinity. Beaver[1] suggests that a large part of the improvement noted after this operation is due to the practice in vogue of administering thyroid extract during the postoperative period, and in support of this view reports a case of extensive uterine carcinoma to which he administered as much as 20 grains of thyroid extract daily for some time; after some months no trace of the tumor could be detected, and the patient was restored to health. Whatever may be claimed by sanguine observers, oöphorectomy should never be employed as a primary operation nor in those cases in which the breast and lymphatic glands can be removed in their entirety.

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[1] British Medical Journal, October 25, 1902.

[2] Medical Record, March 15, 1902.

[3] British Medical Journal, February 1, 1902.

RÖNTGEN RAY TREATMENT. Perhaps the most recent of those methods applicable to the treatment of inoperable carcinoma is the exposure of the tumor to the Röntgen ray. The results have proven in many cases most encouraging. Every precaution must be taken to prevent this form of treatment from being regarded as a substitute for operative intervention in the case of operable tumors. It is a form or style of treatment which will appeal to the lay mind, and there is great danger of this method being taken up by the charlatan or not over-conscientious practitioner and applied to those cases which are eminently suited for operation. Thus valuable time will be lost, and the opportunity of performing a radical operation will pass. From the results of cases hitherto reported it would seem that the best results are to be expected in cases of ulcerating carcinomata. The rationale of the treatment is based upon the hypothesis that the Röntgen ray destroys tissue of low vitality and stimulates normal tissue to greater functional activity. The earliest manifestation of the effects of the rays upon the tissue is an increased discharge from the ulcerating surface; as the tumor disappears the discharge diminishes and the base of the ulcer presents a healthy granulating surface. It is, therefore, advisable to remove as much as possible of the ulcerating malignant mass by the curette in all cases as preparatory to the X-ray exposure.

The effect of the rays upon subcutaneous nodes or upon the glands is much less pronounced and much slower. A very conspicuous feature of this treatment is the diminution in the intensity or the entire relief from pain. Up to the present time it has been impossible to formulate any dogmatic rules as to the character and intensity of the ray appropriate for these cases, as to the length of time of exposure, or other details concerning the technique. From the results which have been obtained we should feel it incumbent upon us to at least give a fair trial to this treatment of inoperable primary or recurrent lesions.

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[1] British Medical Journal, January 14, 1902.

DISARTICULATION OF THE ARM. In the *Annals of Surgery*, January, 1897, Roberts advocated disarticulation of the arm at the shoulder-joint as a routine method of treatment for all cases in which axillary carcinoma occurred secondary to the excision of the breast for malignant disease, and called attention to the difference between this proposition and removal at a later time of the heavy lymphœdematous arm, in order to rid the patient of the weight of a useless member. In 1899 he employed this procedure in a case of mammary carcinoma as a step in the primary attempt to extirpate the lesion. He mentions the priority of Dr. Mynter[1] in performing this operation. Roberts again calls attention to the operation, because, convinced of its propriety and value, and in order to advocate its adoption as a routine measure in all cases of axillary carcinoma and secondary malignant disease of the breast. Ligation of the subclavian vessels should be done preliminary to disarticulation of the arm. The arm should then be removed, together with lymph nodes and other affected tissues. In case it be needed a flap from the outer side of the arm may be retained to cover the defect in the axilla and chest.

He reports a case of amputation through the shoulder-joint in a patient, aged fifty-eight years, who had for several years suffered from left mammary carcinoma.[2] Ulceration was present, and there existed a hard mass under the anterior boundary of the axilla. The patient's chief complaint was severe pain felt in the outer part of the forearm and hand, which was so intense that she voluntarily suggested amputation of the arm. Extirpation of the mass was attempted in order to remove pressure. The breast was excised, and on opening the axilla it was found that the growth encircled and was intimately adherent to the axillary vessels and brachial plexus. It was impossible to remove pressure without excising a part of the brachial plexus, so that, in spite of the debilitated condition of the patient, amputation of the arm through the shoulder-joint was performed after temporary ligature of the axillary vessels *en masse.* A large external flap was formed from the deltoid region of sufficient size to cover the wound on the chest wall. After removal of the arm the subclavian vessels were ligated beneath the clavicle and the wound packed with sponges and rapidly closed. In spite of energetic stimulation the patient died two hours after the operation without having reacted from shock. Had he known the degree of pressure upon nerve trunks he would have started with the intention of amputating the limb after ligating the subclavian vessels above the clavicle.

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[1] Buffalo Medical Journal, 1895.

[2] Philadelphia Medical Journal, 1902, No. 22.

Diffuse True Hypertrophy of the Female Breast. In the summer of 1901 the following case of so-called diffuse true hypertrophy came under the observation of Kirchheim.[1] The patient, aged fifteen years, presented herself at the clinic three months after the onset of the disease, and at this time the breasts were of extraordinary size, of a consistency uniform but firmer than that of the normal gland. The overlying skin was stretched, and the nipple obliterated. As palliative treatment had little if any effect upon the size of the breast, upon the pain or respiratory embarrassment, the breast was amputated. The following measurements were recorded: right breast, greatest circumference, 62 cm.; left breast, 52 cm. The right breast was amputated *in toto* and four axillary glands removed, while on the left side but three sections radiating from the centre were removed, leaving the nipple and portions of the gland. The patient enjoyed an uninterrupted convalescence. The remaining portion of the left breast diminished in size for a short time, but within a month it again began to grow rapidly and caused so much discomfort that the patient pleaded for its removal.

MACROSCOPIC APPEARANCE. The tumor was composed of a central homogeneous mass which represented the glandular tissue uniformly affected by the hypertrophic process. The individual lobes were not separated from the glandular tissue, but sent off prolongations somewhat in the form of a network or mesh. By a process of inclosure islets of fat were, in some places, totally surrounded by glandular tissue.

The microscopic picture of the hypertrophied breast conforms with some exceptions to that of a virginal breast, in that in both these there is a marked predominance of connective tissue over the parenchyma. The latter consists mostly of tubules and undeveloped acini. The connective tissue corpuscles are proportionally increased—an evidence of active proliferation—and the tissue is œdematous. The glandular parenchyma itself, apart from its absolute increase in bulk, presents no deviation from the normal. Macroscopically, the lymph glands exhibit, independent of their enlargement, no peculiar structural change. Microscopically, their structure is characteristic of a chronic indurated lymphadenitis.

Although a relatively large number of cases of hypertrophy of the breast have been recorded, scarcely one writer gives such an accurate and comprehensive description of the anatomical pathological findings as is to be found in the report of Kirchheim's case. Reviewing the records of the 42 cases of bilateral hypertrophy of the breasts, it is difficult to draw any conclusive deductions as to the etiology. Neither hygienic conditions nor inheritance seem to be of any moment. Certain conditions have been accepted as predisposing causes, such as, on the one hand, youth, early menstruation, lymphatic temperament, inclination toward excessive sexual excitement, and, on the other hand, all those factors exerting any influence on the sexual function, such as suppression of menses, pregnancy, the ingestion of certain articles of food-stuffs and beverages in puberty, repeated mechanical irritation of the breast, trauma, etc. But these deductions, based as they are upon theory and individual observation, cannot be unreservedly accepted. As Schüssler has well put it, leaving out of consideration puberty and pregnancy, which from accumulated evidence must be regarded as essential etiological factors, all other conditions are to be regarded as incidental accompaniments rather than true fundamental causal agencies. Reference to the statistics will prove the constant association of pregnancy and puberty with the incipient stages of this affection.

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[1] Arch. f. klin. Chir., Band lxvii., Heft 1.

The clinical course varies in some particulars, but ordinarily the onset is attended with certain objective and subjective symptoms—*e. g.*, tingling, burning, and pain. Exceptionally, the growth is exceedingly rapid, as in two authentic cases in which, without the slightest premonition, the patients awoke to find an enormous increase in the size of the breasts. In some the onset is so insidious as to escape observation, while in others the rapid growth, the menstrual disturbances, and pain soon call the patient's attention to the presence of some disturbance. Pain which is described as burning, tingling, or lancinating, seems to bear no relation to the stage or the size of the growth, and is by no means constant. What is true of pain is true also of the other subjective symptoms. As to the nature of the process, conflicting views are entertained. Delbert regards the hypertrophy as a simple increase of physiological activity. As opposed to this view, instances may be cited in some of which the condition is unilateral or asymmetrical, or in others exhibiting signs of retrograde change. The course is usually one of steady progression; there may be periods of relative quiescence, followed by periods of exceedingly rapid growth. As the disease progresses certain characteristic changes make themselves manifest, and these may, for convenience sake, be divided into two periods. In the first period the contour of the breast, which is described as semiglobular and prominent, remains unchanged, the overlying skin is unaffected and subjective disturbances are confined to such slight interference with respiration as could be accounted for by the weight of the tumor. In the second period appear such symptoms as must follow the ever-increasing weight. The breasts sag down from their normal site over the pectoral muscle and fascia, and become pear-shaped; sometimes they are so huge and pendulous as to cover the chest, abdomen, and thighs; a conception of their enormous size may be had from the figures of Boyer, who amputated two breasts which together weighed sixty pounds. The patient after the operation weighed but one hundred and one pounds, so that the breasts constituted more than one-third of the body weight. Certain other changes appear during this period; the cutaneous veins become much enlarged, the nipple becomes so stretched that it may altogether lose its identity; sometimes it becomes invaginated, and in one case it was said to be gangrenous.

On palpation one notes a change in consistency; at first firm and resistant, the breast now becomes soft, and there is sometimes a sense of fluctuation. It may be uniformly soft or of varying consistency, here and there the glandular lobes being plainly palpable.

Diffuse true hypertrophy of the mammary gland, though essentially a benign affection, exerts a deleterious effect upon the health of the patient; she cannot attend to her daily duties with the same strength and regularity as aforetimes; she can lie only on her side, as the weight of the tumor in the dorsal decubitus causes respiratory embarrassment, and later she will become bedridden. Certain pressure symptoms may be observed, as, for example, the respiratory embarrassment, cardiac palpitation, pain in the ribs, flattening of the chest wall, kyphosis, and gastric disturbances. Anomalies in menstruation are common, but the relation between duration of menstruation and hypertrophy of the breast as one of cause and effect has never been established. This phenomenon is rather to be considered as symptomatic. It may vary in its manifestations from absolute amenorrhœa to menorrhagia. Associated pregnancy is uninfluenced; the patients go on to term and give birth to healthy children. As to the duration of this affection pregnancy alone affects its course; after delivery the breasts usually decrease so in size that the patient is able to attend to her daily duties. They continue to be pendulous, soft, and flabby, and are never restored to their original size and shape. Cases of recurrence, with successive pregnancies, have been observed.

For those cases unaccompanied by pregnancy the prognosis is more grave, since spontaneous retrograde changes such as are manifested after pregnancy never occur. Exceptionally retrograde processes occasionally occur in one breast after the other has been removed, but the restoration is neither complete nor permanent. As the prognosis of those cases occurring in the pregnant varies from that occurring in the virgin, so the treatment varies. In those already pregnant the treatment should be expectant; attention to the diet and to the skin will usually suffice to ward off any threatening complications. In the absence of pregnancy palliative measures should be applied tentatively, but these failing, amputation is imperative—at first removing but one breast with the hope that this will exert a beneficial effect upon its fellow. A more conservative operation, recommended by Poussen, consists in the removal of a large half-moon shaped segment of the breast, extending from the axilla to the sternum and anchoring the gland to the pectoral fascia. This operation resulted, in his case, in the disappearance of pain, but it is very questionable whether in large and growing breasts the result would be permanent. Among palliative measures should be mentioned suspension, compression, the inducement of premature labor, the use of the breast pump, and a number of others only of historical interest.

To establish a differential diagnosis upon either clinical or pathological evidence is a matter of no little difficulty. In the early stages it is absolutely impossible to distinguish between a physiological and a pathological enlargement of the breasts. In the later stages the diagnosis of bilateral cases is easy, since only exceptionally will one meet with bilateral symmetrical new-growths. Of these, sarcomata are most common, but their physical and microscopic characteristics should suffice to differentiate them from hypertrophy. On the other hand, a variety of tumors have been found involving but a single breast, and these cases may be confused with unilateral cases of diffuse hypertrophy. In this class should be mentioned lipoma, fibroma of the interglandular tissue, traumatic angioma, fibroadenoma, retromammary, and subpectoral lipomata, and mastitis adolescentium.

Of the nature of the process—the pathogenesis—the information furnished in hitherto recorded cases is very scant. It has yet to be proven that the hypertrophic process begins in the parenchyma and periglandular tissue, and that the interglandular tissue remains free and the lobular structure unaltered. The latter was demonstrated in five of the hitherto recorded cases. From this it would appear that the interglandular substance is involved secondarily only, a point borne out by anatomical relations of the peripheral segment of a specimen which came under the author's observation. The variation in consistency as elicited by palpation can be explained on this basis. In some cases there have been gelatinous cysts—which are of the nature of retention cysts—and in others dilatations of milk ducts. A microscopic study of the process was made in but five cases. From Billroth's case little if any useful information can be derived, since the hypertrophy was associated with multiple fibrosarcomata. Dahl reports the specimen removed from a virgin as resembling microscopically the tissue of the normal breast of a primipara, except that none of the acini were in a state of physiological activity. Schüssler's, Labarraque's, and Bartel's cases resembled microscopically the findings in the authors; in Schüssler's the fibrillary character of the connective tissue was more pronounced, the nuclei were increased only in certain places.

Whether in every case the essential lesion is an hypertrophy pure and simple is a question yet undecided. So far as one can judge from a single observation, we must regard as unconvincing the proof of the pathological nature of the hypertrophy of puberty, even from microscopic findings.

An inquiry into the pathological and clinical features of the affection brings up the question as to how appropriate the term hypertrophy is.

In that variety of diffuse enlargement of the breast developing during pregnancy the process is a true hypertrophy, an hypertrophy of a physiological type. Pregnancy is, in this instance, the cause for increased functional activity. The relationship between increased physiological activity and hypertrophy is later proven by the disappearance of the hypertrophy at the termination of the period of lactation and its re-appearance at the next period of pregnancy. On the other hand, when the hypertrophy appears in the virgin there is no increase in function, no development of the acini of the gland, and in such a case the hypertrophy must be considered pathological and not physiological. In classifying cases of hypertrophy of the breast of the latter variety the question arises as to whether or not they are of inflammatory or neoplastic type. Those cases which at the onset run a very acute course, or those subacute or chronic cases which have peculiar exacerbations associated with rapid increase in size and certain subjective disturbances—all of these suggest an inflammatory pathogenesis. On the other hand, the microscopic picture characteristic of inflammation is not present, and in the majority of instances the growth is so continuous and so progressive in type as to resemble a neoplasm. From a histological study it might be described as a diffuse fibroma. The process concerns chiefly the periglandular connective tissue. The glandular elements are in no way affected except that they increase, *pari passu*, with the increase of the breast.

The assumption that hypertrophy of the breast is pathologically a diffuse fibroma throws no light upon the pathogenesis or etiology; as to this we are still in the dark.

HEART AND LARGE VESSELS.

Heart. One year ago I prefaced my chapter on this subject with the remark that "the history of this branch of surgery has been a series of successive triumphs." The record of the past year is but a continuation of this triumphal march; clinical observations and experimental research have yielded results that admit of but one conclusion. Together they have demonstrated to the medical world that surgeons must now apply to injuries to the heart much the same principles as guide them in the treatment of wounds of other organs. In the oration in surgery delivered before the fifty-third meeting of the American Medical Association, June 10, 1902, Sherman, of San Francisco, chose for his text "Suture of Heart Wounds." The author conducted a series of experiments upon dogs in order to settle two mooted questions: first, as to the possibility of properly suturing—that is, placing a practical suture in the moving heart—and second, as to the result of the reparative process. The investigations contain so many important points of practical significance that I quote them in full.

EXPERIMENTAL RESEARCH ON HEART WOUNDS. "To discover, if I might, the exact value of these somewhat confused matters, I have exposed the hearts in eleven dogs, and made wounds of various sizes and in different directions in the left ventricle, limiting myself to that particular cavity, since it is the one most frequently wounded. In each instance, except perhaps one, I verified the opening of the cavity of the ventricle by passing an instrument into it so as to get a free spurt of blood during one or more systoles. It was found that this verification was a practical necessity, for the non-penetrating wound of the myocardium will give forth during systole a spurt so large that it could easily be confused with one from the cavity of the ventricle. These wounds were then sewed with ordinary commercial cumolized catgut; in some deep and superficial stitches were combined; in some very deep, so as to surely penetrate the endocardium; and in others very superficial stitches were used. The variations of interrupted, continuous, and recurrent continuous sutures were practised.

"In the earliest operations toothed-thumbed forceps were used to pick up a few muscular fibres to steady the organ for the making of the incision and the placing of the sutures. At the first pinch the heart, of course, delayed a systole, and then began to beat rapidly and violently, and continued this as long as the forceps were in place. It was exactly as if the heart were surprised and at first checked by the intrusion of the forceps' teeth, and then recovered to make violent and strenuous efforts to escape from the grip, and if the forceps' hold were continued it usually succeeded in this by the tearing of the fibres.

One of my dogs died on the table from hemorrhage due to the tearing of the muscle in the bite of the forceps and my inability to at first catch the edge of the open wound in the bottom of a pericardium overflowing with blood, and, although I did finally succeed in getting in two sutures, they were placed too late.

"To overcome this difficulty with the forceps I put into the heart, before excising it, two long suspension loops of silk, dipping the needle and carrying it into the ventricular wall. These gave complete control of the organ, for they did not tear out, and even though the heart was hanging from them its function continued, and much less tumultuously than it did in the bite of the forceps; and with them the heart could be lifted quite half-way out of the pericardial incision, or it could be swung to one side or the other, or rolled over in either direction, its range of motion being limited only by the great vessels at the base.

"I placed these loops side by side and about a centimetre apart, and could then incise between them, hold the wound open, by traction on the loops, to verify penetration, and then, crossing the loops, could absolutely stop bleeding and steady the heart, for under this control the point of the incision seemed to be the starting point of the systolic waves.

"Even with the incision coapted and held relatively motionless by the crossed and taut suspension loops—so that the placing of a suture was no more difficult than in an indifferent tissue—I found it impracticable, yes, impossible, to make a diastole, but to watch the knots as one should into place in the succeeding diastole, and to tie the knots in the ones following. To do this would require a man to work with accuracy, and yet with perfectly timed breaks in his work, in various fractions of successive seconds—for these hearts are always beating more than one hundred times to the minute. And the possibility which I encountered has made it very difficult for me to believe that anyone, even if he has attempted it, has ever really done it, nor can I see what is gained by it.

"The heart does not bleed in diastole, it bleeds in systole, and the suture to be efficient must be tied at that time, and the way to do it is to tie quietly and firmly during the rapid beating of the heart, and to take no account of split second diastoles, but watch the knots as one should watch the knots of the ligature of a major vessel. And the same judgment which controls the tension of the suture should control the depth to which it reaches. I cannot agree, from what I have seen of the actual working of the matter, that a superficial suture will hold when a deep one will tear out. One is suturing the myocardium, not the epicardium. Of course, it is inadvisable to penetrate the endocardium, but it is at the same time, and, fortunately, a difficult thing to do. I did it once because I intended to do it, and I had to take a larger needle than I had ordinarily worked with and definitely carry it through the heart wall and return; and from this I learned that, with the medium-sized, full-curved needle which one would commonly use, the penetration of the left ventricle is not to be feared.

"On this point it only remains to be said that in the case in which the endocardium was included in the stitch the strand of suture stretched across the cavity of the ventricle was the occasion of the formation of a little globular clot, which was found at the autopsy to be firm and white, and surrounded by a large post-mortem clot.

"Elsberg's very complete studies of the healing process showed that the muscular fibres in the grip of the suture atrophy and are replaced by fibrous tissue, and he points out that very evidently there would be less of this lower grade tissue in the case of an interrupted suture; but, so far as I have been able to judge, the difference amounts to very little practically, and the saving of time in the continuous over the interrupted suture is manifest, and it is the method finally advised by Terrier and Raymond a year ago. I had thought that the lessening of the number of knots on the epicardial surface by the use of the continuous suture might be a special point in its favor, but the matter seems to be unimportant, for all knots quickly sink into the tissues, leaving a flush surface which is covered with fibrin."

These investigations, as well as the observations of others, both clinical and experimental, prove conclusively that repair in the heart muscle is in no way different from the repair in skeletal muscles, and that it is no more interfered with by the action of the heart than are the nutritive processes of the organ. So far as is known, none of the cases that have survived the immediate effects of the operation have proved fatal from rupture of the heart wall at the site of the wound.

EXPOSURE OF THE HEART. It is settled, then, beyond question that the wounds of the heart muscle can be closed effectively either with silk or catgut, with a continuous or an interrupted suture, in systole or diastole, and that the wound will undergo repair. But, after all, that is not the most serious or difficult problem with which we must contend. Of much greater concern is the exposure of the heart. While comparatively close to the surface of the body at one point, not only has the bony and muscular chest wall to be traversed, but, what is of still greater significance, two serous cavities have to be invaded. In order to design the best method of exposing the heart, one must consider the topographical relations. As pointed out by Hans Lorenz,[1] the heart lies nearest the anterior wall of the thorax, and must be approached through this structure, but between the heart and the thoracic wall lie structures which must be given consideration. At the plane just above the diaphragm two pleural sacs, the so-called mediastinocostal sinuses lie between the surface of the heart and the thoracic wall, but at this level the pleuræ do not meet in the median line, so that between them there lies a triangular space the apex of which is on a line with the costosternal junction of the fifth rib. During expiration both of the so-called mediastinocostal sinuses are empty, but in forcible inspiration the lung expands into these sinuses and approximates the pleural folds. On the right side the lung on deep inspiration completely fills the sinus, but on the left that portion of the sinus posterior to the fourth, fifth, and sixth ribs remains empty. If we were to remove the sternum to study the relation of the anterior edges or folds of the pleuræ, we would find that the lines representing the margins of the pleuræ descend from the sternoclavicular articulation, at first converging till they reach the line dividing the manubrium from the xiphoid cartilage. They then run parallel to one another to the level of the fourth rib. At this point they separate, the right, diverging slightly, passes close to the junction of the sixth rib and sternum, and terminates at a point where the costal and diaphragmatic pleuræ meet. The left line diverges from the centre more than the right, so that it crosses the cartilage of the sixth rib. Between these two divergent lines there is a triangular space, beginning at the level of the fourth rib and extending downward, in which the pericardium is in immediate relation with the anterior thoracic wall. The dimensions and boundaries of this intrapleural triangle are of great importance to the surgeon performing the operation of paracentesis of the pericardial sac. Unfortunately there has been found, as a result of investigations upon the cadaver, great individual dissimilarity. In some instances this triangle is more to the right, in others more to the left, in some quite broad, and in others very narrow. It always contains a certain amount of fat, and is covered anteriorly by the ligamenta sternopericardiaca; this is in reality a layer of fascia which becomes very much thicker and denser as it crosses the triangle.

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[1] Archiv f. klin. Chirurgie, Band lxvii., Heft 2.

The muscular, osseous, and vascular and nervous structures in this region are of no special interest; the heart lies partly behind the sternum and partly behind the costo-cartilages; that portion underlying the sternum includes two-thirds of the right ventricle, the right auricle, the left auricle, and a part of the left ventricle; the remainder lies behind the costal cartilages.

According to Lorenz, the operator stands on the right side and localizes the third intercostal space and the costo-cartilage junction of the left fifth rib. The incision which includes the skin and pectoralis major muscle begins at the lower border of the third rib at the right margin of the sternum, runs transversely to the point two fingers' breadth to the left of the sternal border, and here describes a convex curve to the costo-cartilage junction of the fifth rib, and from there on to the right border of the sternum, terminating in the region of the seventh costal cartilage. After applying ligatures to the internal mammary artery one inserts the left finger into a small space between the triangular muscle and the edge of the sternum, pushing the pleura backward, and dissects the pleura somewhat backward, so that the finger can enter the triangular space. At the same time the pleural reflection of the diaphragm is separated from the posterior aspect of the fourth rib. As soon as this is accomplished the endothoracic fascia, and with it the pleura and pericardium, is separated from the thoracic wall. This whole procedure is accomplished more quickly and more easily than it can be described. The cartilages and muscles are divided according to the method of Wehr. After dividing the fourth, fifth, sixth, and seventh cartilages under the protection of the left index finger a pair of strong shears is introduced beneath the third rib behind the sternum, and the latter divided at that point. In the same way the sternum is divided at the level of the seventh costal cartilage. The shears he believes to be a safer instrument than either the chisel or saw. The trap-door is now reflected toward the rib, either by dislocating or fracturing the costal cartilages to the right of the sternum. It might be supposed that there would be some danger in injuring the right pleura by this procedure; but there is no ground for apprehension, first, because the costal cartilages are protected or covered by the triangular muscle, and second, because the pleura is protected by the finger. The reflection of this flap gives a perfect exposure of the pleura and pericardium. It may be necessary to separate the pleural layer from the pericardium by a blunt dissection, but this is not difficult. The pericardium can then be opened conveniently by introducing two anchored sutures.

It is of the utmost importance to recognize the endothoracic fascia in the third interspace; in this layer will be found the internal mammary artery, and it is along this layer of fascia that the separation of the pleura from the thoracic wall can be effected with the greatest ease and with the least danger. Lorenz firmly believes that in many cases resection of the sternum in the way prescribed should be reserved for those alarming cases which he designated as belonging to the second group. In all cases he recommends the exposure of the endothoracic fascia in the third interspace, and its dissection from the thoracic wall according to his directions for this reason; when it is not necessary to include the sternum in the flap one naturally would refrain from undermining it in order to avoid injury to the right pleura. If in starting out one is in doubt as to whether it will be necessary to reflect the sternum in order to gain sufficient access to the heart, but, after having begun, finds, on further consideration, that this step is advisable, he may try the following plan: Proceeding as above prescribed, he separates the pleura only as far as the left border of the sternum, and divides the ribs only. Then he reflects the flap on a line of the left chondrosternal articulation; later, if he chooses, he can separate the fascia and pleura from the sternum, and, after dividing the sternum above and below, reflect it with the flap, the base of which now becomes the line of the right instead of the left chondrosternal articulation. This idea corresponds in principle with that of Loison, but differs in its practical application, in that instead of having three flaps, as in Loison's operation, the technique requires but one, and this is easily replaced and as easily fixed in position by anchoring it to but a single rib. The oblique section of the cartilages has among other advantages that of favoring good apposition, fixation, and firm union.

Lorenz admits that his views and suggestions are open to criticism because they are based solely upon studies on the cadaver and theory, but the comparative infrequency of cardiac injuries which come to the surgeon's hands limits to so small a field the experience in the lifetime of any one individual that studies upon the cadaver become almost a necessity to one who would fully familiarize himself with the topographical relationship and grasp the problems and difficulties that beset the surgeon in the treatment of this class of cases.

Nietert[1] made a series of quite extensive experiments upon cadavera by means of long needles passed horizontally backward in the region of the heart, and by repeated experiments was able to outline the boundaries of the pleural cavity pretty accurately. Based upon these observations he outlined a flap suitable for all wounds of the heart in which it is advisable to employ the extrapleural method. The flap is constructed as follows:

"An incision is made from the right border of the sternum transversely across at a level with the lower border of the third rib to a point about one inch to the left of the sternum. A second cut is made from the right border of the sternum across to a point one inch to the left of the sternum and on a level with the articulation of gladiolus with the ensiform. The left extremities of the two cuts are united by a perpendicular incision. The cartilages of the fourth, fifth, and sixth ribs are divided, care being taken to remain close to the cartilages, particularly that of the fourth, as the pleura usually lies closely attached to that rib. It is an easy matter, then, to loosen with an elevator the tissues from the posterior surface of the sternum, as the pericardium is only loosely attached, and there is at no time any danger of injuring it. With a cartilage saw and the costotome the sternum is readily divided. However, care should always be taken not to allow the instrument to pass beyond the right border of the sternum, as there is great danger of injuring the right pleura, which lies immediately back and comes up to the right border of the sternum. I have found it safest, after the sternum had partly been divided, to pass the finger back of the sternum and push away the right pleura before dividing the entire sternum. After dividing these bony structures the entire flap is forcibly turned toward the right side and the cartilages on the right side partly broken." If the pleura has been injured already there is no necessity of employing the extrapleural method; the route in such cases would be transpleural, and the exposure may be very satisfactorily effected by Rotter's method, in which the flap is composed of the third, fourth, and fifth ribs, together with the muscles and pleura in direct relation with them.

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[1] Philadelphia Medical Journal, May 3, 1902.

TECHNIQUE IN CLOSING HEART WOUNDS. The subject of the surgery of the heart and pericardium was presented to the Fifteenth Congress Française de Chirurgie, 1902, by Terrier and Raymond, and the discussion was engaged in by such men as Tuffier, Fontan, Gallet, and Faure. In all essential points the views of these representative French surgeons, who were among the first to recognize that the same surgical principles should be applied to wounds of the heart as to wounds of the other organs, coincide with those that have been accepted by the surgeons of this country. Their technique differs in no important particular.

The essential points in the technique of this operation are these: 1. The exposure. 2. The selection of suture material. 3. The introduction of the suture. 4. The closure of the wound. We have already dwelt at length upon the various methods of exposure. The material that seems best adapted for suture is silk; catgut has been and may be used, but, taking all in all, silk is the more reliable. The idea advanced that all the manipulation attending the introduction and tying of the sutures must be executed in diastole has about been abandoned. The experiments of Sherman and the views of Le Dentu and other observers prove conclusively that wounds of the heart muscle may be closed effectively either with silk or catgut with a continuous or interrupted suture in diastole or systole.

The wounds in a large percentage of cases which survived the immediate effects of the injury or operation became infected, and the majority of these cases terminated fatally—that is to say, out of twenty cases ten were the seat of infection, and of these six died, so that the presence or absence of infection very materially affects the prognosis. It is more than likely that the infecting organisms gain access in the wound at the time of the accident rather than at the operation; but, whichever may be the case, statistics should teach us to treat the wound from the beginning as one infected. On this account drainage should be introduced not only into the pericardium, but into the pleural cavity as well. A strip of gauze, which is the best drainage material, should be introduced at the most dependent portion of the external wound, and need not extend very far into the pericardial sac, since, as pointed out by Mignon and Sieur, with the patient in the reclining position, the heart will sink toward the dorsal aspect and displace the fluid toward the ventral side. If at the end of forty-eight hours no evidences of infection are manifest the drainage should be removed.

With reference to the technique of cardiotomy and cardiorrhaphy, the operative technique was so carefully worked out in Ricketts' experimental research upon the dog that his results deserve recognition, and his own conclusion may be appropriately introduced at this point. Experimental physiology and surgery show what can be done in heart surgery. Twenty-five dogs were used in experimentations; penetrating and non-penetrating wounds of the heart were made and closed with sutures of different material. Interrupted silk sutures were found to be the best. No special aseptic precautions were taken, as all pathological conditions were desired. The author found that the pericardium could be entirely removed without death resulting. Either of the coronary arteries could be ligated at its base without producing death. In a certain class of cases he concludes that it is best to suture the pericardium to the chest wall, that drainage may be perfect. It is ideal to suture during systole, but one will be satisfied to secure perfect suturing in systole or diastole. Even though the auricular is thinner than the ventricular wall, it may be sutured with equal success. Owing to this difference in thickness the percentage of penetrating wounds of the auricles is much greater than those of the ventricles. The author is of the opinion that the application of surgical principles in certain cases of aneurism of the heart will, no doubt, in the near future be accomplished by suture, electrolysis, or the injection of gelatin or something of a similar character. The removal of a certain class of foreign bodies, whether they have formed within or have entered from without, will, no doubt, be accomplished. That a cardiac abscess should be incised and drained, he thinks, there can be no doubt. Tumors of a pedunculated character on the external surface of the heart can and should be removed. Pedunculated tumors within the cardiac chambers can also be successfully removed. Parasitic cysts (animal or vegetable) when upon the external surface of the heart or in its wall should be incised and drained. Mitral stenosis, hypertrophy, and dilatation of the heart will sooner or later find complete or partial relief within the domain of surgery.

Lacerated or incised and penetrating and non-penetrating wounds of the heart should be sutured. Suturing or any other surgical procedure should not be discontinued because the heart should cease to pulsate. The work can and should be completed within a much shorter time on a quiescent heart. All means should be resorted to, while the suturing of the myocardium is being completed, to re-establish the heart's action.

Drainage of the pericardial sac is necessary in many cases of injury of the heart. Exploratory incision of the pericardial cavity and its contents has been shown by both experimental research and operations upon the living human body to be exceedingly rational, valuable, and justifiable.

SYMPTOMATOLOGY IN HEART WOUNDS. Nietert[1] classifies the signs produced by heart wounds under three headings: 1. Signs that indicate internal hemorrhage into the pleural cavity. These include the constitutional effects of severe hemorrhage and shock, the signs of a hæmothorax, the signs of pericardial effusion, together with two physical signs which are almost pathognomonical—a splashing sound heard over the pericardium, indicative of the presence of blood not under pressure, and a whizzing sound due to the presence of air within the pericardial sac. 2. Signs produced by hemorrhage to the exterior, an intermittent stream of blood either of a red or blue color, according to whether the wound is seated in the left or right heart, plus the signs of hemorrhage and shock and minus the signs of hemorrhage into the pleural cavity. There will be a slight increase in the area of cardiac dulness. 3. Signs produced by hemorrhage into the pericardium alone, including more or less cyanosis, depending upon the amount of pressure on the heart, embarrassment of respiration on account of the compression of the auricles and large vessels, increase in the area of cardiac dulness, very feeble, barely audible heart sounds, the splashing sound•audible first, but disappearing as the pressure in the pericardium increases.

OPERATIONS DURING THE PAST YEAR. In April last Nietert operated upon a case of penetrating wound of the heart at the St. Louis City Hospital. The operation, performed without an anæsthetic, consisted in exposing the heart, enlarging the wound of the pericardium in order to relieve intrapericardial pressure, which was great enough to seriously embarrass the heart, and closing the wound with sutures. Since that time he has had under his observation another case of penetrating wound of the heart. The patient was seen a few hours after the injury, the nature of which was promptly recognized, and the operation performed at once. The reflection of an osteoplastic flap revealed a penetrating wound of the left pleura, pericardium, and left ventricle. The wound in the latter was closed with two interrupted silk sutures, and drainage was introduced at the pericardial and pleural sacs. With the exception of a pleurisy the convalescence was uninterrupted. At the date of his discharge he complained of dyspnœa after violent exercise, but in all other respects his recovery was complete.

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[1] Philadelphia Medical Journal, May 3, 1902.

Nini[1] reports a case in which the wound was situated in the right ventricle. In order to secure enough room for introducing the sutures it was necessary to resect a portion of the sternum. The patient bore the operation well, but died four days later from sepsis.

In addition to the case which Fontan[2] reported in 1900, a second recently came under his observation, in which the patient had received a stab wound in the region of the left nipple. The wound, situated at the apex and 5 mm. long, was closed with a catgut suture. Despite the fact that the patient developed a pneumothorax, pleurisy, and phlebitis, he ultimately recovered.

The fourth of the series reported during the past year was a case of penetrating wound of the heart entering the left ventricle. The patient was thirteen years of age. The wound, which was inflicted with the blade of a knife, was three-quarters of an inch in length, and emitted a stream of blood at every systole. The operation, performed eight hours after the accident, consisted in reflecting a musculo-osseous flap bounded above by a line beginning about five-eighths of an inch from the left border of the sternum and running along the third rib for a distance of four inches; below, by a line parallel to the first, on a level with the sixth rib; to the axillary side, by a vertical line along the anterior axillary line, connecting the first and second. The third and fourth and fifth ribs were cut through with the pleura. There was no blood in the pleural cavity, but the pericardium was enormously distended. The opening in the pericardium was enlarged to a distance of two and one-half inches, and about ten ounces of blood evacuated, immediately after which the pulse improved. The heart was steadied by introducing the hand beneath it and pressing upward, and the visceral wound closed with catgut suture. The pericardial sac was irrigated with a saline solution and the wound closed with seven interrupted catgut sutures. A drainage was introduced into the pleural cavity, and the flap in the chest wall was replaced and sutured in position.

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[1] Estratto degli atti della R. Academia Medico-Chirurgica di Napoli, Anno lv., No. 3.

[2] Bull. d. l'Acad. de Méd Année, lxvi., series 3, No. 11.

The patient began to improve about three days after the operation, and on the fifteenth day was allowed to sit up. His recovery was uninterrupted.[1]

The fifth case of the year, reported by Gibbon,[2] was a penetrating wound of the right ventricle, just below the pulmonary opening and very near the septum. The operation was performed within an hour of the time the accident occurred, and it was found necessary, in order to keep the patient quiet, to administer a small amount of chloroform. On opening the pericardium dark blood spurted out in a considerable stream, but owing to the rapid, irregular movements of the heart it was difficult to find the wound. When it was finally discovered the tip of the forefinger was inserted into it and hemorrhage arrested. The patient died on the table just after the suture was introduced. The autopsy disclosed the fact that the suture had passed through but one side of the wound of the heart.

The sixth and last case was observed and treated in the service of Launay,[3] and is exceptionally interesting, because the heart sustained two wounds (from a gunshot injury)—a wound of entrance and a wound of exit. The bullet penetrated the left pleural cavity, entered the anterior surface of the left ventricle, and made its exit from the posterior surface of the ventricle near its base. Both ventricular wounds were closed with catgut sutures, the pericardial sac and pleural cavity were drained and the wound closed. Drainage was removed at the end of forty-eight hours and the sutures on the eighth day. The patient entirely recovered.

In the six years following the first attempt to treat a penetrating wound of the heart thirty-nine cases have been reported. Of these, seven died on the table of hemorrhage and ten soon after from the effects of hemorrhage or the result of shock. Of the twenty-two that remain, sixteen recovered and only six died, and these of infection subsequent to the wound and operation. If we assume, as is at least reasonable, that seventeen of the total number of cases died, either in spite or because of the operation (Sherman), the percentage of recoveries in the remaining cases is 75 per cent.; including all of the thirty-nine cases the mortality was 43 per cent. If, as Sherman says, we wish to consider only the final success or failure of suture of the heart muscle, we must limit our inquiry to the cases in which this procedure was really tested. According to Nietert, the percentage of recoveries in untreated cases is but 10 per cent., so that whether we accept 43 per cent. or 75 per cent. as the most equitable estimate the results speak strongly in favor of operation as against palliative treatment. The most conservative estimate warrants this view of the situation.

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[1] Medical Record, November 29, 1902.

[2] Philadelphia Medical Journal, November 1, 1902.

[3] Gazette Hebdomadaire de Médecine et de Chirurgie, August 3, 1902.

RESULTS OF CLOSURE OF HEART WOUNDS.

(Medical Record, November 29, 1902.)

No.	Operator and year.	Location of external wound.	Chamber wounded and size of wound.	Time of operation after injury.	Anæsthetic.	Results and remarks.
1	Farina, 1896	Just above the margin of the left sixth rib, near the sternum.	R.V.; $^1/_4$ inch: 3 stitches.	....	....	Death on sixth day from bronchopneumonia.
2	Cappelen, 1896	Fourth left intercostal space in mid-axillary line.	L.V.; $^4/_5$ inch.	1 hour.	....	Death after several days from pericarditis; branch corouary artery cut.
3	Rehn, 1896	Fourth left intercostal space near sternum.	R.V.; 3 stitches.	Following evening.	....	Recovery; empyema.
4	Parozzani, 1897	Seventh left intercostal space in mid-axillary line.	L.V.; $\frac{3}{4}$ inch; 4 stitches.	5 hours.	None.	Recovery.
5	Parozzani, 1897	Third left intercostal space.	L.V.; $^3/_5$ inch; 2 stitches.	$\frac{1}{2}$ hour.	None.	Death on second day from anæmia (?); interventricular septum had been cut.
6	Fummi, 1898	Under left nipple.	Apex; cavity not opened; 1 stitch.	Several hours.	....	Recovery; empyema.
7	Ninni, 1898	Fifth left intercostal space.	L.V.; 3 stitches.	Quickly	None.	Death on table.
8	Parlavecchio, 1898	Fifth left intercostal space.	L.V.; $1\frac{1}{2}$ inch; apex; 4 stitches.	8 hours.	Chloroform	Recovery.
9	Giordano, 1898	Second left intercostal space.	L.V.; $^4/_5$ inch; 4 stitches.	$\frac{1}{2}$ hour.	None.	Death on 19th day from empyema; abscesses of right lung.
10	Nicolai, 1899	Fourth left intercostal space middle way between margin of sternum and nipple.	R.V.	$1\frac{1}{2}$ hr.	Yes.	Death after twelve hours.
11	Tuzzi,	Fourth left intercostal space.	Two wounds; one non-penetrating.	....	None.	Death on 22d day from empyema; pericarditis
12	Longo,	Fifth left intercostal space; $^2/_5$ inch internal to nipple.	L.V.; 3 stitches.	At once	None.	Death in 15 minutes.
13	Ramoni,	At third left cartilage, $^4/_5$ inch from sternum.	R.V.; 2 wounds; one non-penetrating; 4 stits.	....	None.	Recovery.
14	Marion, 1899	Shot through breast.	R.V.; catgut sutures.	....	....	Death.
15	Rosa, 1899	Fifth intercostal space.	L.V.; $^3/_5$ inch; not certain it penetrated ventricle.	....	None.	Recovery.
16	Horodynski, 1899	....	R.V.; $1\frac{1}{2}$ cm. long.	....	....	Death.
17	Maliszewski, 1899	....	....	....	....	Death.
18	Maliszewski, 1899	....	....	....	....	Death.
19	Bufnoir, 1899	Sixth left intercostal space.	R.V.; gunshot, 22 calibre.	....	....	Death; necropsy showed perforation of ventricle, and the anterior opening only had been sutured.
20	Pagenstecher, 1899	Fourth left intercostal space beneath nipple.	L.V.; $1\frac{2}{3}$ inch, near apex; 3 celluloid stitches.	16 hrs.	None.	Recovery.
21	Nanu, 1900	Third intercostal space, 4 cm. from edge of sternum.	R.V.; 2 cm. long; 2 interrupted sutures.	....	....	Death on fifth day from infection of pericardium and pleura.
22	Caselli, 1900	Below and internal to left nipple, cutting sixth rib.	L.V.; near apex; 2 stitches.	$1\frac{1}{2}$ hrs.	None.	Death in 12 hours.
23	Fontan, 1900	Six wounds with scissors between third and seventh ribs in cardiac region.	L.V.; 12 mm. long; continuous catgut sutures; 3 stit.	6 hours.	Chloroform.	Recovery.
24	Nietert, 1901	....	R. V.; penetrated; 3 silk sutures.	....	....	Death after 36 hours.
25	Vaughan, 1901	Fifth left costal cartilage divided.	L.V.; $2\frac{1}{2}$ cm. long; continuous silk sutures; 7 stitches.	$\frac{3}{4}$ hour.	Ether.	Death on table from hemorrhage about completion of operation.

No.	Operator and year.	Location of external wound.	Chamber wounded and size of wound.	Time of operation after injury.	Anæsthetic.	Results and remarks.
26	Nietert, 1901	Left of sternum.	L.V.; not sure cavity was penetrated; 2 stits.	....	....	Recovery.
27	Nini, 1901	Left of sternum.	R.A.	....	....	Death in 4 days; sepsis.
28	Mignon et Sieur, 1901	....	R.V.	....	....	Death.
29	Fontan, 1901	....	L.V.; catgut sutures.	....	....	Recovered; had empyema.
30	Brenner, 1901	Left of sternum, near sixth cartilage.	R.V.; 7 cm.	Following day	Yes.	Death on table; degenerate heart muscle.
31	Watten, 1901	Fourth right intercostal space.	R.V.; 3.5 to 4 cm.	....	....	Recovery; right pleura wounded; pneumothorax.
32	Lastaria, 1901	....	L.V.	....	....	Died soon.
33	Zulehner, 1901	....	L.V.; ½ cm. long.	....	....	Suture tore out at once, and patient bled to death on table; heart showed fatty degeneration.
34	Zulehner, 1901	....	R.V.; 1 cm. long; sutured with catgut.	....	....	Recovery.
35	Stern, 1901	....	L.V.; pistol shot; unable to suture on account of location of wound on posterier surface; close d the opening with gauze.	....	....	Death in 30 minutes.
36	Launay, 1902	....	L.V.; anterior and posterior walls; pistol shot; catgut sutures in each.	....	....	Recovery; no complications.
37	J. H. Gibbon, 1902	....	R.V.; 1 suture.	....	....	Died on table.
38	L. L. Hill, 1902	Fifth intercostal space, a little to the right of space.	L.V.: ⅝ inch; 1 catgut suture.	8 hours.	Chloroform.	Recovery.
39	Stewart, 1902	Fourth intercostal space, half-inch to left of sternum.	L.V.; ⅝ inch; 6 catgut sutures	At once	Ether.	Death on third day.

ULTIMATE RESULTS. As far as I am aware, the cases that have been subjected to operation have not been followed up for any length of time. If the patient recovered from the immediate effects of the injury and operation he was discharged and no further observations made; certainly none have been published. The subsequent history of a case which Fontan reported as having recovered is of considerable interest. The patient died five months after operation from cerebral embolism. At the autopsy a cerebral abscess was found in the right sphenoidal lobe, and a cone-shaped clot in the left ventricle of the heart, attached at its base to the situation of the suture, quite friable and undoubtedly the immediate cause of the fatal issue.

Rupture of the Septum Cordis is generally believed to be due to the application of external force, but in the case[1] about to be recorded the lesion was attributed to the force of a systolic contraction of the left ventricle resisted by the occlusion through compression of the aortic end of the aorta and left auricle. The child was run over by a wagon, the wheel passing obliquely across the left side of the thorax. There was no evidence of external injury, the heart sounds were normal, but there was an extensive area of dulness in the left side of the abdomen, which was attributed to a ruptured spleen. An operation was performed, and a tear in the right kidney discovered. The patient died within twelve hours, and the autopsy revealed the rent in the septum cordis. Despite the existence of this serious heart lesion the child survived for a period of twelve hours, a major operation lasting a half-hour.

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[1] Mitt. aus d. Grenz. d. Med. u. Chir., Band viii., Heft 4 u. 5.

Rhythmic Compression of the Ventricles as a method of resuscitation was first suggested by Maurice Schliff in 1874, where he claims to have restored life to dogs that had been seemingly killed by chloroform. Hock and Prus and Maag each credits himself with the originality of this idea. Prus conducted one hundred experiments upon dogs, forty-four having been killed by asphyxiation, twenty-one by chloroform asphyxia, and thirty-five by electric shock. Waiting sixty minutes after all cardiac contractions had ceased he seized the heart in his right hand, placing the thumb upon the right ventricle and his fingers upon the left, and pressed the same rhythmically to imitate diastole and systole. In one hundred cases he revived the cardiac action fifty-five times, forty-seven completely and eight irregularly, once after an interval of fifteen seconds, and once only after two hours. As a result of these experiments, Prus did not hesitate to affirm this operation as applicable to man, but it was not until 1898 that his suggestion was adopted. At this time, Tuffier, Galley, de Lege, and Michaux all employed the method, but with unfavorable results. It is interesting to note that in Tuffier's case the action of the heart was temporarily restored. In 1900 and 1901 the method was again tried, but without success. In all the cases in which this treatment was applied prior to 1902 the heart was exposed by the thoracic route, and the pneumothorax that resulted was of itself, no doubt, responsible for many of the fatal results. Mauclaire, in order to avoid this complication, suggested the adoption of the diaphragmatic route to the heart, and had an opportunity to test its value. Maurice Boureau,[1] in a very interesting review of the whole subject, suggests, before further investigations are carried out, appealing to the physiologist for an opinion as to how long complete inertia of the heart can last before the case should be regarded as hopeless. He had employed the diaphragmatic route twice, in both instances unsuccessfully, and knew of ten other equally unsuccessful attempts.

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[1] Revue de Chirurgie, 1902, No. 10.

At a meeting of the British Society of Anæsthetists, Starling[1] reported what is alleged to be the first successful case of the employment of rhythmical compression of the heart. During an operation for appendicitis under nitrous oxide and ether anæsthesia upon a man, aged sixty-five years, the cardiac action and respiration ceased about simultaneously. The operator, Mr. W. Arbuthnot Lane, after the usual method of resuscitation had failed, grasped the motionless heart through the diaphragm and practised rhythmical compression until he felt pulsation. In about twelve minutes the pulse became perceptible at the wrist, and the respiration reappeared. As was pointed out in an editorial notice in the *Journal of the American Medical Association*, the success of this rough-and-ready method suggests the possibilities of the measure and demonstrates the advantages of this over the open methods. The exposure of the heart either by the thoracic or transdiaphragmatic route is in itself a serious operation, and in many of the hitherto recorded cases death may have been due to this alone. Over a year ago Freyberger tried to resuscitate a case of chloroform syncope during an operation upon a case of sciatica. After ten minutes were spent in fruitless attempts to resuscitate the patient, a tube was introduced into the trachea and insufflation was practised, but to no avail. The heart was then exposed by resecting the third and fourth ribs and subjected to rhythmical compression. After a short time slight spontaneous contractions were felt. These contractions gradually increased, but not until half an hour had elapsed did respiration become spontaneous, at first feeble and infrequent, but gradually becoming deeper. Three hours after the attempts at resuscitation were initiated rhythmic compression of the heart and artificial respiration were discontinued. One hour later respiration again became embarrassed, and soon ceased, and every restorative measure failed. The patient throughout this period never regained consciousness, the pupils did not react to light, and were contracted, the radial pulse was never perceptible, and the temperature of the body was fairly maintained. Death was supposed to have been due to chloroform paralysis of the centre of respiration in the medulla. Despite the fact that artificial respiration was persisted in and the action of the heart was restored, this vital centre never reacted from the shock.

At the Fifteenth Congres Française de Chirurgie, Terrier and Raymond, in speaking of massage of the heart for the treatment of chloroform syncope, said the method does not recommend itself to most authors and does not appear to offer any solution of the problem. If, however, one is desirous of practising it, the best method of exposing and approaching the heart is by the route through the diaphragm as recommended by Mauclaire. This method of approach is by all means the best, avoids the possibility of producing pneumothorax, and is particularly applicable to chloroform syncope occurring in laparotomies or in cases in which the abdominal cavity has already been opened.

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[1] Lancet, November 10, 1902.

At the same congress Gallet said that his experience with the treatment of chloroform syncope by so-called massage of the heart did not bear out the claim that the circulation may be sustained until the patient reacts. Neither in his research work nor in his clinical experience with four cases had he in any instance been able to prove the efficacy of this operation. He considered it extremely dangerous, especially under the unfavorable conditions which necessarily exist, and wholly unwarranted. If the mortality of chloroform anæsthesia is to be reduced it will not be by the adoption of any such method as massage of the heart, but by determining the indications and contraindications for the employment of chloroform as an anæsthetic.

Tuffier, on the other hand, said that in the case of dogs he had been able to revive them after they showed unquestionable signs of death for a period not exceeding ten minutes; after that time all attempts at resuscitation failed. On the human subject massage of the heart is a very grave operation, and should not be attempted until at least all other measures have been tried and failed.

Suture of Arteries. We are indebted to Hubbard[1] for a very interesting historical sketch of the work that has been done upon suturing of the bloodvessels. After Lambert's work, in 1762, and Hallowell's work, about the same time, the operation fell into disrepute from the unsuccessful experiments of Assman in 1773, and no more attempts were made until after the discovery of antiseptic methods, when, in 1881, Czerny sutured the internal jugular vein in man. From this time on the repair of injuries to veins came to be more and more generally employed until, in 1892, Schede reported twenty-five to thirty successful cases of his own, including one of the inferior cava.

Surgeons entertained serious doubts as to the possibility of repairing wounds in the arteries until 1889, when Jassinowsky published his series of successful experiments. The next advance in this field must be accorded to Murphy, who, in 1897, demonstrated by experimentation the danger of suturing a wound of more than one-half the circumference of the artery. In a wound of such magnitude the vasovasorum are so destroyed that necrosis of the vessel wall and secondary hemorrhage would almost surely follow. Murphy advised in such wounds the resection of the wounded portion of the artery and the invagination of the approximal into the distal portions. There was still some dispute as to the best suture material and as to the best method of introducing the sutures and of controlling the circulation during the operation. Dorfler conducted a series of experiments, with a view of settling these disputed points. He demonstrated: 1. That while it was safer to adopt measures of controlling the circulation which would not injure the intima, but at the same time a bruise or tear of the lining coat would not necessarily result in thrombosis. 2. That injuries to the intima are of consequence only in that they may predispose toward infection or to interference with the circulation. Infection and obstruction to the circulation are regarded as the factors responsible for the majority of failures. 3. That it was not necessary to exclude the intima when introducing the stitches, and that the time saved by introducing the suture through all three coats far outweighed any disadvantage which is said to be associated with the injury inflicted by the suture upon the intima. The advantages of introducing the suture through all the coats are, first, that it is easier of application; second, that it is applicable to thin-walled vessels; and third, that the suture passes with certainty deep enough to prevent its tearing out.

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[1] Boston Medical and Surgical Journal, March 27, 1902.

In 1894 Abbe carried out some experiments, with a view toward determining whether or not it would be of any advantage to employ mechanical devices in effecting anastomosis. In 1900 Payr published a report upon the results of the employment of a mechanical device analogous to the Murphy button in effecting anastomosis between the divided ends of the wounded artery. The absolute essentials to success in the technique of these operations are in the first place absolute asepsis. If the wound becomes infected there is much greater likelihood of a thrombus forming and much greater probability of secondary hemorrhage. Circulation may be controlled by clamps of rubber, but is better still by pressure with the finger or by torsion with bands of gauze. The suture should just fill the hole made by the needle, and both needle and suture should be the finest that can be handled. Continuous suture is recommended because it minimizes the handling of the structures and because it leaves a thread with which to hold one wall away from the other while introducing the sutures. Silk is regarded as a better suture material than catgut, in that it is nonabsorbable, and therefore acts as a nidus for the formation of a firmer cicatrix. It is advisable to suture the sheath of the vessel to protect the wound in the artery from any infection that may develop in the overlying tissues. Pressure should be released, first, from the distal end of the artery in order to test the suture before allowing the full blood pressure to be exerted upon the wound. The indications for the execution of this operation in practice are few. It is particularly serviceable in wounds of large arteries, such as the femoral or brachial, where the application of a ligature and sudden interruption of the blood supply might cause gangrene. The operation may have a limited field in the treatment of traumatic and dissecting aneurisms. As absolute contraindications to the operation should be mentioned an infective arteritis or atheroma of the vessel walls, for unless the vessel wall be healthy at the time of operation the operation will invariably be unsuccessful.

In considering the prognosis, one must take into consideration the possibility of subsequent thrombosis, of cerebral embolism, and aneurism. Experiments would seem to prove that the danger of cerebral embolism is practically *nil*, and that the danger of aneurismal formation is very slight. Hubbard has been able to collect up to the present time the following twenty recent operations on arteries by which he demonstrated the practical value of this procedure:

1. Durante, 1892. Tibial artery wounded during removal of chrondrosarcoma; catgut sutures through adventitia and media; next year amputation for recurrence; artery then found without any change except a narrowing at the site of suture. 2. Durante, 1892. Amputation of breast; axillary artery wounded; catgut sutures. 3. Rosa, 1892. Suture of wound in brachial 7 mm. long, including only two other coats. 4. Heidenhain, 1894. Wound of axillary artery while dissecting glands in axilla; catgut sutures. 5. v. Zoege Manteuffel, 1895. Wound of femoral while operating on arterio-venous aneurism; sutured. 6. Israel, 1895. Common iliac injured during a perityphlitic operation; silk sutures through all layers. 7. Ssabaujeff, 1896. Embolus in femoral artery from ulcerative endocarditis; gangrene threatened; an attempt was made to remove the embolus, but the patient was too weak to permit Ssabaujeff to carry out his whole plan; the artery, however, was opened and sutured; nineteen days later the patient died from the endocarditis, and a spindle thrombus was found along the opening in the intima. 8. Orlow, 1896. Wound in popliteal artery sutured through all the layers; additional stitches through adventitia and connective tissue; amputation later, when artery found patent but narrowed. 9. Murphy, 1897. Bullet wound of two small aneurismal sacs of femoral; one-half inch of femoral artery dissected; proximal and invaginated into distal, the adventitia having been peeled off proximal; after the invagination it was pulled down over the line of suture and fastened there; the suture also of femoral vein. 10. Lindner, 1898. Femoral artery wounded during an operation for intestinal resection; suture with silk through all the coats; safety stitch through the adventitia. 11. Garre, 1898. Internal carotid injured during removal of cancerous glands; silk sutures through adventitia

and media. 12. Garre, 1898. Wound of upper arm the day before entrance to hospital; wound of brachial artery sutured through all coats; after operation pulse and color returned to the hand, which had before been pulseless and cyanotic. 13. Gerard Marchant, 1898. Arterial suture of humeral for arterio-venous aneurism; doubtful result. 14. Richard, 1899. Axillary artery wounded during operation on axilla; catgut sutures. 15. Cammagio, 1899. Wound of femoral artery sutured through all the coats. 16. Hummell, 1900. Four to five centimetres of femoral artery resected because involved in cancerous growth; proximal end invaginated into distal. 17. Seggel, 1900. Artery wounded in neck by would-be suicide; silk sutures through adventitia and media; jugular vein also sutured. 18, 19. Pacha, a Russian, is reported to have done two cases by the Murphy method on the axillary artery. 20. Peugniez. Suture of artery for arterio-venous aneurism.

Wound of the Pulmonary Artery. Mauclaire reported at the last Congres Française de Chirurgie the results of an operation for the closure of a wound of the pulmonary artery at its origin. He was called to see a patient with a deep wound of the thorax one hour after the accident had occurred. The wound was on the level of the left intercostal space, 3 centimetres from the sternal border. A complete pneumothorax and symptoms of intrapericardial effusion were discovered, and death seemed imminent. On account of the situation of the wound and the existence of a pneumothorax the anterior thoracic route was selected. A thoracic flap, including the third and fourth ribs, was reflected and exposed to view a distended pericardium, with an irregular wound, and the pleural cavity distended with blood. Upon opening the pericardium and evacuating the bloody effusion a strong jet of blood was seen coming from a wound in the pulmonary artery. Temporarily controlling the hemorrhage with the index finger, he applied to the wound a pair of Kocher's forceps. Three sutures were introduced, and two pairs of forceps were applied at the inferior part of the wound. The pericardium and the pleura were drained through the seventh intercostal space at the axillary line, and the thoracic flap replaced and sutured. Fourteen hours later the forceps were removed. There was no leakage upon the removal of the forceps, but the patient, already much exhausted, succumbed at the end of twenty-four hours. At the autopsy it was ascertained that the wound lay at the origin of the pulmonary artery. The arterial sutures seemed to have held well. Death was undoubtedly the result of hemorrhage and the traumatic pneumothorax.

Introduction of Air into Wounded Veins. The sudden introduction of air into wounded veins can occur spontaneously in the course of an operation.[1] At the present time, where patients are under an anæsthetic and do not therefore move much or take such deep inspirations as to inhale a large quantity of air at one time, this accident is not of a very serious nature. But in some cases—fortunately, exceptional—air enters in large enough quantities and sufficiently suddenly to cause immediate death. In these cases the air kills by mechanical action, causing an acute overdistention of the right cavities of the heart, and thereby preventing them from contracting. When this alarming accident occurs the operator has been at a loss to know what will afford relief.

In the case of dogs it is possible to resuscitate them by gradually withdrawing the air through the aspiratory needle introduced into the right ventricle. At first the heart stops, but begins to beat again, and the animals soon recover. The small quantity of air which may remain does not embarrass the circulation.

Begouin proposes the use of this method, viz., puncture of the ventricle in man, but only in those cases in which death seems imminent. In the less serious cases, in which a smaller quantity of air enters the vessels, death is due to embolism and not to overdistention of the right ventricle, this operation is not to be employed. The most favorable point for the introduction of the aspirating needle is the left edge of the sternum on the level of the fourth intercostal space. Aspiration should be stopped once nothing but blood passes through the needle.

Traumatic Arterio-venous Aneurisms. The report which Matas[2] has given us of his personal observation in one case of traumatic arterio-venous aneurism of the subclavian vessels has attracted our attention because of the thorough and sytematic way in which the case has been written up; because of the anomalous distribution of the vessels; because of the recovery of the patient after an operation lasting almost five hours, half of which was conducted under local anæsthesia and the remainder under chloroform anæsthesia. The patient, aged twenty-eight years, was shot by his antagonist holding a revolver close to the patient's chest. The essential features of the case were the following: The lesion caused by the bullet was a true aneurismal varix of the middle third of the subclavian artery and vein, just where the vessels are separated by the musculo-aponeurotic partition formed by the scalenus anticus. The patient rallied from the shock immediately following the injury, but anxiety as regards the immediate complications were not dismissed until the ninth day after the injury; at this time it was thought he had probably escaped the dangers of secondary hemorrhage and immediate complications, but in view of the fact that the patient was determined to run the risk of an operation rather than face a future of possible disability and invalidism, Matas was led to operate in spite of his doubt as to the wisdom of his decision. The operation, which was performed nine days after the injury, consisted essentially in the section and elevation of an osteoplastic flap formed by the clavicle, skin, sternomastoid, and subcutaneous tissue, the exposure and preparatory control of the venous side of the aneurism, the exploration in search of the innominate and in the application of a provisional ligature around the anomalous subclavian. A considerable amount of time was spent in searching for the innominate artery, which in this case was absent. Instead of the trunk there was a very large vessel which ascended upward into the right side of the neck in the direction of the sub-

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[1] Revue de Chirurgie, 1902, No. 11.

[2] Journal of American Medical Association, January 25, February 1, 1902.

FIG. 4.

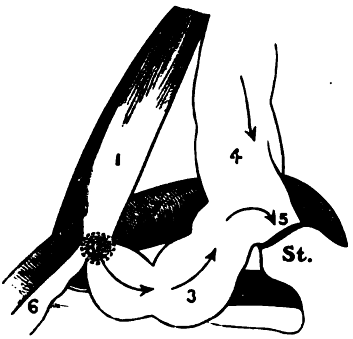

FIG. 5.

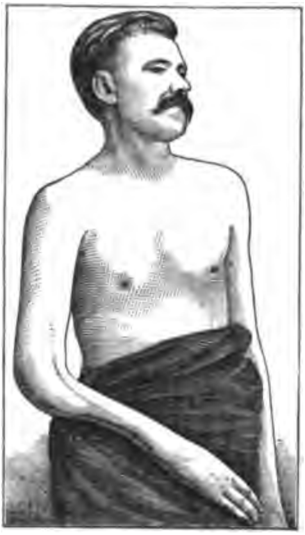

FIG. 4.—Diagrammatic representation of arterio-venous communication—after excision of clavicle. 1. Scalenus anticus. 2. Scalenus medius. 3. Subclavian vein; the arrows show direction of arterio-venous current. 4. Internal jugular vein. 5. Innominate vein. 6. Axillary portion of the subclavian vein much reduced in size as a result of angular traction from adhesion of vein to scalenus, and great distention of proximal side of vein, with arterial blood poured in by artery. 7, 7. Anomalous subclavian artery; the innominate absent (no carotid). 8. Anastomotic orifice indicated by dotted lines. St. Sternum. (Case of M. M.)

FIG. 5.—Arterio-venous aneurism of the right subclavian vessels; from photograph taken after complete healing of the wound and sloughed surfaces had taken place. The deformity resulting from sloughing of the forearm and hand is shown on the arm (right) paralyzed by the injury. (Case of M. M.)

clavian artery. The common carotid as well as the innominate artery was absent.

Up to this time a little over two hours had already been spent in the operation so far conducted under local anæsthesia. From now on the operation was conducted under partial chloroform anæsthesia, the patient never being absolutely unconscious, replying intelligently to questions which were asked and drinking cold water, toddy, and hot beef-tea at various intervals. The next step in the operation consisted in the detachment of the subclavian vein from the artery at the point of injury after failure to identify the third portion of this artery at the scalene on account of the amount of exudate which masked it completely. There was profuse hemorrhage from the artery at the anastomotic orifice, in spite of complete control of this vessel at its origin. The artery was finally ligated on either side of the bleeding-point, and the orifice in the vein closed without obstructing the lumen. The patient by this time was profoundly shocked and exhausted. The osteoplastic flap was hurriedly replaced and the wound closed. Though the subsequent career of the patient after the operation was marked by many incidents which delayed convalescence and caused much anxiety as to the ultimate fate of the arm, there was never any serious apprehension as to his ultimate recovery. The patient was discharged from the hospital in very good condition on the sixty-first day, but his arm had not entirely healed until the two hundred and nineteenth day, when his last dressings were discarded. At this time he presented the appearance as shown in the accompanying photographs. He had lost his thumb and little finger, and the remaining digits were stiff and completely anæsthetic. His wrist was stiff and his forearm very much reduced in size and lacked the ulna bone. Nevertheless, he had slight supination and pronation, caused by preservation of the biceps tendon, and fairly good flexion and extension at the elbow-joint; the skin was devoid of sensation up to the elbow. Partial mortification of the hand and thumb in this case were traceable to the arterial ischæmia, probably favored by the defective innervation of the parts. This mortification of the extremities is more liable to occur when the subclavian is subjected to torsion in its second division, which obliterates or injures the orifices of the thyroid axis, vertebral, and other branches. The provisional loop of silk which had been applied around the origin of the subclavian to secure prophylactic hæmostasis failed to control bleeding from the approximal side of the arterio-venous orifice when the vein was detached; hemorrhage was controlled only after the artery had been secured by a double ligature applied on either side of the bleeding point.

Matas summarizes and analyses 15 cases of arterio-venous aneurism gathered from the literature, all of which were traumatic in origin, and included injury to the vessels on either side irrespective of the topographical division of the artery involved.

1. Nine were caused by stab or penetrating cut wounds; 6 by bullets. 2. All the patients were men. 3. The injuries were almost all inflicted upon comparatively young subjects. Of the 9 whose ages are distinctly specified, the oldest was thirty-two years of age at the time of injury; the youngest fifteen years. In 6 cases the ages are not specifically stated, but the evidence would point to the fact that none had exceeded the middle period of life. 4. In 6 cases the vessels on the left side were injured; in 7, those on the right; in 2 the injured side is not given. 5. The seat of injury was absolutely demonstrated to be in the subclavian vessels in 7—Wattmann's, Wederstrandt's, Will's, Rotter's, Wedekind's, Veiel's, Matas'—either by autopsy or operation. 6. In all the cases but 2, in which the seat of the lesion is either positively or approximately stated, the third division outside the scalenus was implicated. In Letenneur's case injury of the first division was suspected. In the author's the second division was positively involved.

In the 8 other cases the diagnosis of injury of the subclavian vessels was confirmed by the seat of the external lesion, direction of weapon, and range of the missile, the tumor, the immediate effect upon circulation of the arm, and the other physical signs showing that the subclavian trunks and not their branches had been injured.

In 5 of the 15 cases the brachial plexus was coincidently and partially injured; positively in 3—Larrey's, Wederstrandt's, Matas'; probably in Letenneur's and Kirsch's cases. In several cases in which reference to the condition of the arm is made the disability of the arm was pronounced, but was either due to primary or secondary vascular disturbances—Wattmann (secondary), Smith, Arango, Wedekind, Veiel.

Primary circulatory or neutral disturbances may have existed in other cases, but this cannot be stated from the published reports. The time after the injury when the first sign of arterio-venous aneurism was recognized is stated in 8 out of the 11 unoperated cases; in 3 it is only approximated; in 1 the characteristic thrill and murmur were apparently altogether missing—Will's case; in 3 no information in this point can be obtained. In 1—Matas'—the signs of arterio-venous communication were established within four hours after the injury; in 3 cases they were present on the second day—Larrey, Wederstrandt (?), Rotter; in 3 the diagnosis was made on the third day—Letenneur, Kirsch (?), Wedekind; in 1 on the sixth day—Fischer (?); in 1 on the eighth day—Arango; in 1 on the ninth day—Veiel; in 1 "a few days later" after the injury—Bérard's case. Apart from injury to the brachial plexus and purely vascular disturbances in the arms, complications are noted in Wattmann's case—secondary phlegmonous inflammations of arm; in Will's—septic hæmopyothorax; in Wedekind's—septic phlebitis and pneumonia. In only 3 of the 15 cases did secondary hemorrhage follow after the primary injury, and these were all stab wounds—Will, Rotter, Veiel.

Of the 15 cases 11 were treated expectantly, and of these 1 died from secondary hemorrhage and septic complications three weeks after the injury and after the external wound had healed—Will's case. The remaining 10 all survived the immediate effects of the injury, their wounds healing after the cessation of the primary hemorrhage.

Only 4 out of the 15 cases were operated upon, in three of these—Rotter, Veiel, Matas—within twelve days after the injury, and all recovered; in 1—Wattmann's case—thirty-two years after the primary injury, when the ligation of the subclavian was necessitated by urgent aneurismal complications, and this was the only fatal case. The total mortality of the entire group is, therefore, 13⅓ per cent.

An investigation of the individual records as far as they are available shows the following results as regards the final outcome of this injury on the vessels and upon the affected arm:

In 11 out of 12 cases which were treated primarily by the expectant plan 11 recovered from the immediate effects of the injury, and their wounds healed without secondary hemorrhage, except 1—Will's case—by simple measures of compression with bandages, rest, etc., but it is to be noticed also that only in one or possibly two—Larrey and Arango—was there reason to believe that the lesion had been cured. In all the signs of arterio-venous aneurism remained active, and in several the murmurs and sounds after many years were so annoying that the patients applied for relief on this account. In 1 case it was more than ten years after the injury—Sansom's case. In 6 cases—Larrey, Kirsch, Wederstrandt, Smith, Fischer, Wedekind—permanent circulatory and trophic disturbances persisted in the arm, not only from associated injury to the brachial plexus, but from interference with circulation; in 1—Smith's case—gangrene set in, with loss of part of the extremity (fingers, hand, and forearm), more than seven months after the patient had recovered from the injury. In the other unoperated cases, with the exception of 3—Wattmann's succumbed thirty-two years afterward after thirty years of latency; Will's died from secondary hemorrhage three weeks after the injury, and Smith's from gangrene of the extremity seven months after—it is only fair to state that the abnormal conditions of the circulation created by this lesion were, with the exception of the annoyances and disturbances previously referred to, fairly well tolerated, and were not incompatible with a long survival and active life. It is well to note, however, that in at least 6 of these cases the patients were last seen or passed out of the observation of the surgeons who reported them within a few weeks or months after the injury, while the lesion was still active, and too soon to permit any definite conclusions as to the final outcome of the injury—Bérard, a few weeks ; Smith, seven or eight months ; Fischer, one year ; Letenneur, twenty one days ; Kirsch, two and one-half months ; Wedekind, seven months.

In 4 only of the 15 cases was an operation resorted to ; in 3 cases ligation of the vessel was made imperative by the occurrence of violent secondary hemorrhage following shortly after the injury, and in only 1 —Matas—was the operation deliberately performed in anticipation of future complications. Three out of these 4 cases permanently recovered, except Wattmann's patient, operated on in 1840, who died of secondary hemorrhage twenty-three days and thirteen hours after the ligation of the third portion of the subclavian.

Speaking of the treatment of arterio-venous aneurism, Matas says there are three classes that present themselves for discussion : 1. What is the best treatment that can be applied to arrest the primary bleeding at the time of injury ? 2. After the arrest of the primary hemorrhage and the patient has rallied from the shock, and it is evident that one or both vessels have been injured, shall we proceed immediately to secure the bleeding point or wait for future developments, hoping that the wound will heal, that no secondary bleeding will occur, and that if it is a double injury a permanent arterio-venous communication will be established ? 3. After the existence of an arterio-venous aneurism is fully established and the wound has apparently healed, shall we consider the patient out of danger and discharge him while this lesion is in an active state, trusting to nature's tolerance of this condition and to the remote possibility that it may be spontaneously cured ?

As to the first question, primary hemorrhage is best controlled by digital compression or from a compress in the wound ; by packing the wound if it is a punctured cut, and holding the packing firmly wedged in the wound by suturing the edges of this over the packing ; or by hermetically sealing the wound with continuous stitch. This procedure, followed by a firm compression bandage, will usually suffice to arrest the external bleeding until the patient is taken to a hospital, where a flat bag filled with lead shot and held over the injured area with an elastic bandage will so prevent any further primary external bleeding.

There is some difference of opinion as to the treatment to be adopted in the second group of cases or of those in which primary hemorrhage has been arrested and the patient has rallied from the shock. Some surgeons regard the rule laid down by Rötter, namely, that "ligature of the artery should be performed as soon as the patient has recovered from shock, if possible on the day of the injury, when the vessel should be secured in the wound," to be applicable in all cases; while others, including Matas, are inclined to believe that this treatment should be carried out with certain modifications.

If the primary hemorrhage is profuse and obstinate; if it tends to recur with the restoration of the circulation after shock; if the hæmatoma is extensive and progressive, then there can be no hesitation as to the urgency of surgical action, whether the evidence points to a single or a double injury of the associated vessels.

If, on the other hand, the primary bleeding is moderate and is readily controlled by pressure, or ceases spontaneously and completely, and there is no extensive or progressive hæmatoma; if there is no tendency to bleeding upon the removal of the dressing, then delay—*i. e.*, armed expectation—is permissible. If, in addition to the favorable signs, there is an early development of the signs of arterio-venous anastomosis, then a conservative attitude is more than ever justifiable, provided, always, that the patient can be kept under eompetent and skilled surgical supervision (Wedekind).[1]

With reference to the third class of cases, or those in which the aneurism is fully established, well tolerated, and gives rise to little disturbance, Matas believes, in view of the results that have been attained in previous cases, that the old rule of non-intervention is still in order, and should be followed. The decision in this matter must rest largely with the personal equation and experience of the operator. On the other hand, Matas believes with Delbet that with the improved conditions of the present day the indications for operation have broadened; that whenever the lesion is not well tolerated and gives rise to serious circulatory or other disturbances, it is justifiable to operate, with a view to extirpating the lesion, especially when situated in the more accessible third and second divisions of the artery.

THE LUNG.

During the past year no material advances have been made in the surgery of the lung unless it be that the opinion of the profession as to the indications and contraindications for disease are becoming more crystallized. The surgical profession is unanimous in its recommendation of operation in the treatment of acute simple abscesses and acute abscess following gangrene. Operation has resulted in the recovery of 90 per cent. of the former and 61 per cent. of the latter. While the indications for intervention in the case of acute abscesses following gangrene are quite as positive the results are not nearly so good as those of chronic abscesses following gangrene. In cases of echinococcus cyst of the lung some 90 per cent. have recovered. As to bronchiectasis, Quincke and others are disposed to regard it as unsuited for surgical methods on the ground that drainage *via* the bronchi will be more efficacious than through an artificial opening. The mortality of operative attacks upon this lesion is about 80 per cent. When we come to look into the question of tuberculosis we find the pendulum swinging in the direction of conservatism.

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[1] Journal of the American Medical Association, January 25 and February 1, 1902.

Surgical Treatment of Pulmonary Tuberculosis. Perhaps the most important of the papers bearing upon the subject were presented to the Surgical Section of the American Medical Association by De Forest Willard and Horace J. Whitacre.[1] The latter selected for his title "The Inoperable Nature of the Tubercular Lesion." Whitacre has chosen a very sensible way of investigating this mooted question. Rather than collect statistics, which are at best confusing, of the results of operations performed upon tuberculous subjects, he studied the reports of almost a thousand specimens with a view toward determining whether the lesions as presented at the autopsy could have been relieved by surgical intervention. This study consisted in making serial sections made from lungs previously hardened and in reviewing clinical observation upon 978 cases of pulmonary tuberculosis. The following points were investigated: It was his purpose to determine the most common location of the pulmonary tubercular lesion; the extent of lung tissue involved in the course of the development of the different stages of the disease; the location of the secondary involvement; the possibility of excising the lesion in its first or second stage; the presence and extent of pleuritic adhesions; the location of cavities, their accessibility, their operability; the frequency with which a tuberculous cavity becomes an acute abscess; and, lastly, the nature of the usual septic process in phthisis. A study of the distribution of the lesion would show that in 0.93 per cent. of the cases the apex alone was involved. In 1.01 per cent. both apices were involved. In 1.3 per cent. one upper lobe and the opposite apex were involved. In 3.6 per cent. both upper lobes were involved. In 8.5 per cent. two upper and one lower. In 2.6 per cent. one upper and one lower on the same side. In 1 per cent. the entire lung on one side and the apex on the opposite side; while in 74.9 per cent. of these cases both upper and lower lobes were involved. In estimating the extent of lung involvement it has been considered that when the physical signs of tubercular involvement extended below the fifth rib posteriorly that the apex of the lower lobe was involved. An apex involvement is included under the heading of lower lobe involvement.

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[1] Journal of American Medical Association, September 27, 1902.

TABLE SHOWING THE DISTRIBUTION OF LESIONS.

	Per cent.
One apex alone	0.93
Two apices alone	1.00
One upper lobe alone	2.30
Two upper lobes alone	3.60
One upper and lower in same side	2.60
Two upper and one lower	8.50
One upper and two lower	1.20
One upper and opposite apex	1.30
One upper and lower and opposite apex	1.00
Two upper and two lower	74.90

In 14.5 per cent. of the cases the patient gave a history of having had pleurisy at some time during the past few years, while physical examination revealed pleurisy in 30 per cent. of cases. In none of the cases coming to autopsy were the lungs free from adhesions.

Emaciation of a pronounced character was present in 82.6 per cent. of cases, slight in 14.6 per cent., and absent in 2.8 per cent.

Knowing the character, situation, and number of the lesions with which the surgeon may have to deal, what can be accomplished by pneumectomy, what by pneumotomy, what by nitrogen compression methods, what by thoracoplasty?

I. *Pneumectomy.* Taking these procedures up seriatim, it necessarily follows that good results from excision of a tubercular focus in lung tissue must depend entirely upon the complete excision of the tuberculous focus and the absence of other foci. The operation is therefore excluded in cases showing involvement of all four lobes (74.9 per cent.), in involvement of an upper and lower (2.6 per cent.), in two upper and one lower (8.5 per cent.), one entire side an opposite apex (1.3 per cent.), and when both upper lobes are involved. In other words, in 98 per cent. of cases pneumectomy would be contraindicated, leaving but 2 per cent. in which the operation could be considered suitable. Knowing how difficult or almost impossible it is to determine the precise margin of the diseased area either before or during the operation, we may conclude that on the whole the operative procedure is both irrational and impossible.

II. *The drainage of cavities* is practised to promote cicatrization, to liberate pent-up pyogenic secretions, and to allow cavities left by a healed tuberculosis to cicatrize. But is it a justifiable or rational procedure? The principles that apply to the treatment of a pyogenic abscess do not obtain in the case of the tubercular cavity, because the lesions are entirely dissimilar. In the former the seat of germ activity is in the lining membrane, the wall of the abscess cavity is filled with reparative vascular granulating tissues, and all surrounding parts are not already necrotic, but well supplied with nutrition; in the latter, on the other hand, the wall is composed of non-vascular, non-regenerative necrotic tissue containing none of the specific organisms. Drainage of such a cavity could accomplish nothing; the contents are innocuous, and even were there any tendency to the formation of granulation tissue the anatomical conditions are such as to prevent obliteration of the cavity by cicatrization and contraction. As to the drainage of these cavities which are the seat of mixed infection, Whitacre makes the following statements: "1. The vast majority of lung cavities are located in the apex or in the upper lobe of the lung, sites shown by Quincke to be most favorable to drainage through a bronchus. 2. In the 978 cases studied, Dr. Lyle has not seen a single one in which a cavity has been the seat of such an infection and an operation a possible element in the relief of symptoms. 3. The very chemical nature of caseous material (representing as it does a product so low in the scale that it is incapable of further disintegration) makes it an unfavorable if not actually an impossible culture medium for pyogenic germs. 4. Should such infection and decomposition occur often or at all, patients with cavities would certainly have very bad breaths. This is not true. Cavity patients rarely have an offensive breath. 5. Mixed infection in the area of active tubercular inflammation—the active septic pneumonia—in lung tissue not in cavity is unquestionably the element that plays the part of importance in the septic cases. 6. The temperature charts are presented of three patients who have had cavities for five, three, and two years respectively. These temperature curves are merely samples of all these cases. They are neither high nor septic, and these men have been subjected to all the vicissitudes of the climatic conditions. 7. The majority of tuberculous cases do not run high temperatures at any time. In this series 25.5 per cent. of the cases treated run an average daily and weekly temperature below 99° F.; 24 per cent. between 99° and 100° F.; 20.7 per cent. between 100° and 101° F.; 14.8 per cent. between 101° and 102° F.; 10.4 per cent. between 102° and 103° F.; while 5.2 per cent. gave an average daily temperature above 103° F. In general, it may be said that in 70 per cent. of cases the temperature was never above 101° F., and 85 per cent. of cases never above 102° F. Furthermore, septic temperatures are not found. 8. The persistence of a sinus is the usual result after drainage, and most of the patients so treated have been more annoyed by this than by the severe symptoms; some have said that death was preferable."

Granting that certain cavities might be suitable for drainage, there would yet remain the difficulty of selecting the cases. Sarfert, a zealous advocate of operative treatment of pulmonary tuberculosis, admits that among hundreds of cases only a single one may be suitable for operation. The evidence against drainage of tubercular cavities is so overwhelming that Whitacre believes this method should not be included within the scope of surgical attack upon the lung.

III. Of the *nitrogen compression method* it may be said that its application is safe, that in a limited number of cases the procedure is a rational one, and that the effect is so favorable as at least to offer some encouragement. It should be remembered, however, that a large percentage of cases have no pleural cavity into which nitrogen gas can be injected, that the extent and degree of pleuritic adhesions are extremely variable, are not uniformly present under given pathological conditions, and are rarely coextensive with the tuberculous involvement of the lung. The question of the presence or absence of pleurisy can, unfortunately, not be positively determined by the history or physical examination. In 978 cases only 14.5 per cent. gave a history of pleurisy, and in only 30 per cent. was pleurisy recognized by physical examination. According to the table already presented only 4 per cent. of cases would be suitable for this form of treatment.

IV. *Thoracoplasty* is a method based upon the same principle as that of nitrogen compression, but it is a very much more serious procedure, and, as it would be carried out on patients much reduced in vitality, the mortality would be very high. Furthermore, animal experiments by Whitacre have shown that an extensive resection does not secure the complete rest to the lung that is afforded by the nitrogen method. In those cases in which the operation might be regarded as suitable climatic treatment renders a fair percentage of recoveries.

Willard[1] believes that with improvement of technique *pneumotomy* will become a practicable operation even in cavities at the apex. The operation, he says, would be exceedingly helpful in the early period of cavity formation, but it is exceedingly difficult at this stage to obtain the consent of the patient, since dietetic and hygienic methods of treatment often result in cure. In advanced cases where the infection is already a mixed one and the cavities multiple, pneumotomy may be employed as palliative measures to relieve cough, hæmoptysis, and sepsis, but never as a radical procedure. The third indication for the operation includes abscesses of lower lobes, following pneumonia or pleurisy, whether or not they have become tubercular.

The operation itself is not attended with any technical difficulties. Two inches of the ribs must be excised; if there be no adhesions the pleural layers should be brought in apposition by introducing four sutures placed in a parallelogram, and the completion of the operation postponed for a day or two. The cavity must be searched for with finger and aspirating needle, and the pus evacuated; hemorrhage may be controlled by packing. If the abscess is deep seated and a considerable section of healthy lung tissue exposed in order to lay the abscess open, then the fresh area should be mopped with a chloride of zinc solution to prevent infection of lymph spaces. If acute pneumothorax and collapse of the lung should complicate the operation the opening in the pleura should be rapidly closed with the finger, and intrapulmonary pressure increased by an artificial respiratory apparatus.

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[1] Journal of American Medical Association, September 27, 1902.

Pneumectomy, according to Willard, is not advisable in our present stage of surgical and diagnostic skill, but with improved technique tubercular foci of the lung will be eradicated as we now eradicate tubercular lesions of joints and other tissue.

RESULTS. The statistics, based upon a collection of 73 cases carefully tabulated in Willard's paper, gives one a general idea of the results that may be anticipated from the surgical treatment of cavities.

Pneumotomy of apex, 34; recoveries, 20 (of whom 2 died in from three months to three years later); deaths, 14; operative recoveries, 59 per cent. Lower lobes, 20; recoveries, 15 (of whom 2 died within fifteen months); speedy deaths, 5; operative recoveries, 75 per cent. Location of cavities not mentioned, 7; recoveries, 4; deaths, 3; operative recoveries, 57 per cent. Total pneumotomies, 61; recoveries, 39; deaths, speedy, 22; deaths later, 10; operative recoveries, 64 per cent.

Pneumonectomies, 6; recoveries, 4; operative recoveries, 67 per cent.

Excision of ribs to produce collapse of chest and lung, 8 operations on seven cases; recoveries, 5 (one died three years later); deaths, 3; operative recoveries, 63 per cent. (Although the cases are few, yet the percentage of recoveries is no better than when lung was entered.)

Total operations for tuberculous cavities, 75 upon 73 cases, with 64 per cent. of operative recoveries. It is impossible to secure the final result in these cases, and even if secured it would be difficult for faithful comparison to set aside 73 cases of precisely equal severity; moreover, the results that would have been obtained from medical treatment in these 73 cases can be only conjectured. The presumption is that they were of serious type, otherwise they would not have been subjected to operation, consequently the ultimate death rate would have been very high under any form of treatment.

Quincke,[1] who is one of the pioneers in pulmonary surgery, advocates early operation upon non-tubercular abscesses, but believes there is nothing to be gained by opening a tuberculous cavity. The walls of the latter, disseminated as they are with tubercles, have not sufficient vitality to establish a reparative process, and even were the cavity opened the abscess would not undergo repair unless sufficient of the wall were resected to render it flexible. Far more can be gained by immobilization than by any other form of treatment. This may be accomplished by producing an artificial pneumothorax or by an extensive thoracoplasty.

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[1] Mitt. aus den Grenzgebieten der Med. u. Chir., Band lx., Heft 3.

Gangrene of the Lung. The principles and technique in the management of pulmonary abscess are applicable alike to pulmonary abscess and gangrene. The courses of procedure will depend largely upon whether adhesions are present or not. If the latter be the case the lung may be stitched to the parietal pleura before penetrating the pleural cavity. It is never advisable to grasp and open the lung in the absence of adhesions, as an acute pleurisy will develop almost invariably. Packard and Le Conte report their experience with a case of gangrene of the lung secondary to bronchiectasis. A portion of the seventh rib was excised and a gangrenous area exposed. This appeared to be single, and was swabbed out with a piece of gauze, a rubber drainage tube inserted, and the dressing applied. The patient died on the twentieth day, and the autopsy revealed a low grade inflammation of the whole right lower lobe of the lung surrounding the gangrenous area.

Embolism of the Pulmonary Arteries. Lotheissen[1] has collected 66 cases of pulmonary embolism following injury or operative interference, including 36 fractures, with 30 deaths; 6 contusions, with 5 deaths; 4 tendon and muscle operations, all fatal, and 20 operations, with 16 deaths. The mortality of the series is about 85 per cent. The symptoms pointing to venous thrombosis are often absent. The thrombi developed most frequently in the veins of the leg, in the region of the pelvis, and in the hemorrhoidal plexus. No doubt the predisposing causes of thrombosis are slowing of the blood current and certain changes in the endothelial coats of the vessel wall. When the embolus becomes lodged in the pulmonary vessel, symptoms develop suddenly, at first pallor, then cyanosis of the face, a feeling of terror, dilatation of the pupils, irregularity and embarrassment of the heart's action constitute the symptom complex. The Mahler pulse phenomenon is not always to be demonstrated.

Bronchiectatic Abscess. Because the condition is more or less general, localization difficult, and because if one or more cavities are obliterated others may form, the operative treatment of this condition has not found much favor in the eyes of the surgical profession. Putnam[2] believes these objections are more than counterbalanced by the following benefits to be derived from operative intervention: The foul

[1] Beiträge zur klin. Chir., Band xxxii., Heft 2.

[2] Medical News, September 13, 1902.

smell disappears, the nauseating taste of the pus is no longer present, the frequent vomiting ceases, and the septic process, which may lead to fatal metastatic lesions, is removed. For these reasons he urges early diagnosis and early operation. In the case which he operated upon the improvement in nutrition was so great as to give promise of no further recurrence; though there is still a bronchiectasis throughout both lungs there is absolutely no fetor of breath to the sputum and no disagreeable odor to the breath.

Anterior Mediastinotomy. A year ago Milton recommended this operation for the exploration of the anterior mediastinum, and removed a foreign body from the trachea through an incision just above the bifurcation. By a modification of the method Picard[1] removed a tracheal canula which had lodged at the bifurcation of the trachea. The patient died on the sixth day, but, in spite of the unfortunate outcome, Picard recommends this method of exposing and exploring the anterior mediastinum. The pleuræ can be retracted without any difficulty, and the trachea can be felt as it lies behind the aorta. It must be said that the movements of the lung and aorta are somewhat embarrassing.

Traumatic Apnœa or Asphyxia. Burrell[2] reports a case of severe contusion of the thorax in which three ribs were fractured, the patient developing a peculiar condition of the skin. From the level of the third rib upward over the neck, face, and scalp the skin presented a dusky, bluish, mottled appearance. There was continual conjunctival hemorrhage and minute retinal hemorrhage. Burrell thought the condition to be cyanosis, but the fact that the discoloration did not cover the entire body, that it did not disappear on pressure, that it persisted even after the patient improved, made it evident that this supposition was wrong. On the eighth day after the accident the bluish color faded, and in three days had altogether disappeared.

Foreign Bodies in the Air Passages and Lung. In all but 2 of 15 cases cited by Killian[3] the foreign body was successfully extracted by the aid of the bronchoscope. In 1 of the 2 unsuccessful cases the proper instruments were unattainable, and in the other the foreign body was lodged in an abscess with a minute opening. Not only is the endoscope serviceable in extraction, but in the localization of the foreign body. In a series of 20 cases high bronchoscopy was successful in locating the foreign body in 9 out of 11 cases, and low bronchoscopy in every case. The results of attempts at removing foreign bodies from the lung through an open wound have been so fatal that a trial should certainly be given with the endoscope before even considering operative intervention. When this method fails we may still hope that the foreign body will be removed by spontaneous expectoration or through a tracheal opening. Should all these measures fail, the surgeon is justified in resorting to a pneumotomy, since in all cases in which the foreign body definitely remained in the lung the patient died, death being due to the development of bronchial ectases and lobular pneumonia. Korteweg[1] has studied the data and statistics bearing upon this subject, pointing out the difficulties and dangers attending a pneumotomy undertaken for the removal of these bodies. A preliminary operation, securing the adhesion of the pleural membranes, must precede the invasion of the lung. Two weeks must elapse before the adhesion will be firm enough, and during this time there will be some pain in the wound, and this will be exaggerated when the patient coughs. He, therefore, coughs as little as possible, consequently there is increased retention of pus, with all its concomitants. Hyperpyrexia, pneumonia, and cerebral embolisms often appear after the preparatory operation, but when these dangers are passed other difficulties are met with. The abscess cavity may have been successfully opened; but despite this a very small quantity of pus is discharged through the drainage tube, and the bulk is expectorated as before.

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[1] Bull. et Mém. de la Société de Chirurg. de Paris, xxvii.

[2] Boston Medical and Surgical Journal, January 4, 1902.

[3] Deutsche med. Wochenschrift, August 2, 1902.

In addition to this, it may be impossible after the cavity is reached to remove the foreign body through the wound. According to Tuffier's tables, in 11 operations 4 died suddenly after the operation; not one patient was entirely cured; in only one instance was the foreign body removed, and the patient recovered with a fistula; in 2 cases the foreign bodies were coughed up after the operation; in 4 the foreign body was not removed, though the patients felt a great deal better. All these operations were performed after an abscess from bronchiectasis had developed, and while they may improve the patient's condition they will never effect a cure. The best that can be expected is the removal of the object and recovery with a pulmonary fistula. The course to be pursued in the treatment of foreign bodies in the lung either immediately or shortly after the accident must be influenced by the character of the object. With grains of corn, shoe-buttons, objects that are more or less smooth and rounded, rather than irregular or angular, the probability of spontaneous expectoration is not inconsiderable; palliative measures are, therefore, justified in the early stage. Given a case, however, where the foreign body, as in the case to be recorded, is a fragment of a shell, there is much to be said in favor of early operation. In the later stages, when abscesses have developed and the patient's condition is not only uncomfortable and distressing, but a cause for grave anxiety, the propriety of operation is much less open to doubt. Korteweg reports a case, said to be the second on record, in which a foreign body was extracted through an external wound. On April 17th the patient was wounded in several places by fragments of a shell, one of which penetrated the right lung. About six months later, after the preliminary operation had been performed, the object was located by the introduction of exploratory pins. A wound in the lung was made, the object found and extracted. Two months later the patient was discharged in perfect health. The splinter measured 4.5 centimetres in length and weighed 42 grammes.

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[1] Annals of Surgery, July, 1902.

THE PLEURA.

Chronic Empyema. A year ago Fowler introduced to the profession a new operative procedure for the treatment of chronic empyema—decortication of the lung, so-called—an operation which we believe is founded on sound principles, and in suitable cases should yield excellent results. Kurpyjweit[1] is disposed to attribute much of the success that has attended the procedure to the extensive resection of the ribs, with adaptation of the soft parts to the lung. He claims that the gaping of the incision of the divided thickened pleura is not due to expansion of the lung, but to the release of thoracic tension, which in turn allows of greater thoracic excursion.

Mignon,[2] an advocate of the thoracoplastic method, lays stress upon the absolute necessity of the surgeon's knowing precisely the shape and position of the cavity before he can hope to operate with any degree of intelligence. Neither catheterization, injection of liquid, percussion, auscultation, nor the endoscope will supply sufficient knowledge of the topography of the individual case. This can only be obtained by digital exploration. Therefore, the operation should begin with the enlargement of the pleural fistula sufficiently to allow of the introduction of the finger. Further intervention will depend upon the shape of the cavity. For convenience sake empyemic cavities may be divided into three classes: (1) Those with their long axis transversely placed; (2) those with the long axis vertical; (3) those with the long axis more or less pyramidal. 1. As to the first class—the transverse. A rectangular flap with the base corresponding to the lowest point in the cavity is reflected and a portion resected from each rib forming the outer wall. The length of the portion of rib to be excised should be *greater* than the transverse diameter of the cavity. One should never hesitate to remove the parietal pleura when it is thick and will interfere with collapse of the wall or with drainage. 2. As to the second class, the course to be adopted will vary according to whether it is situated at the anterior (vertico-anterior), lateral (vertico-lateral), or posterior (vertico-posterior) aspects of the chest. The vertico-lateral cavities have a transverse diameter of but ten to fifteen centimetres and a vertical axis corresponding to the mid-axillary line. A vertical incision is made corresponding in length to that of the cavity, and through this a portion of each rib is removed, the section of excised rib always exceeding in length the width of the cavity. It is seldom necessary to go higher than the fourth rib. The vertico-posterior cavities extend transversely from the posterior axillary line to the costo-vertebral junction, and extend almost to the third rib. Owing to the position of the scapula, it is impossible to resect all the ribs forming the outer wall, but, fortunately, this is not essential. It will suffice to resect about four centimetres of each rib as near as possible to the vertebral attachment. In the vertico-anterior cavities the vertical axis corresponds to the anterior axillary line, and the operation corresponds to that recommended for the vertico-lateral cavities. When, as often happens, there remains, as a result of a thoracoplastic resection, a long narrow fistula or gutter about the width of one's finger, this should be freely laid open and the edges of the skin sutured to the edges of the pleura in order to prevent the superficial union of the lips of the wound and the reformation of the fistulous tract. 3. Pyramidal or triangular cavities, with their base below, are the most difficult of all to treat successfully. A transverse incision is made along the base of the cavity and the lowermost rib of the cavity wall resected. At right angles to this a vertical incision is carried up to the apex of the cavity and two triangular flaps resected. The remainder of the ribs constituting the outer wall are then resected, and the corresponding parietal pleura excised. The upper portion of the wound is closed, the lower is left open for drainage, and compresses are applied in such a way as to keep the outer wall in apposition with the visceral pleura.

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[1] Beiträge zur klin. Chir., Band xxiii., Heft 3.

[2] Revue de Chirurgie, 1902, vol. xxii.

In all cases Mignon regards curettage as dangerous, and contents himself with brushing off the granulation with gauze. Drainage should always be introduced at the most dependent portion of the wound. In the majority of instances, except when dealing with the transverse cavities, a second operation will be necessary, and this should be performed precisely as the first.

Jordan[1] gives us the results of 21 Schede operations, 2 of which were combined with the Delorme method. Of these there was 1 operative death, 12 wholly recovered, and 2 almost so; 1 was unimproved and 4 died of general tuberculosis. From his experience with these cases he outlines the treatment of chronic empyemata as follows: In the empyemata of long standing the best results are to be obtained from the Schede operation, but in order for the operation to be successful it must be a radical one. Inasmuch as exact knowledge of the intrathoracic lesion is to be obtained only by direct inspection and palpation, the operation should begin with an exploratory incision and resection of one or two ribs, the subsequent steps to be dependent upon the results of the exploration. Should the pleura be found degenerated it should as far as possible be excised or slit (resection plus decortication), but decortication should not be practised alone. In children complete regeneration of the resected ribs may be expected; the earlier the operation is performed the more perfect will the results be. Tuberculous empyemata as a class are not to be included among the operable cases, with the exception, perhaps, of those cases in which the cavity is small, the lung but little involved, and the general condition good.

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[1] Beiträge zur klin. Chirurgie, Band xxxiv.

Tumors of the Chest Wall and Lung. Acute pneumothorax is recognized as one of the most serious complications attending extensive resection of the chest wall for the extirpation of tumors. Accordingly, measures are usually adapted to prevent the sudden collapse of the lung that inevitably follows the entrance of air into the pleural cavity. Dollinger,[1] however, recommends the production of an artificial pneumothorax as a useful operation preparatory to the extirpation of extensive tumors. Several days in advance a drainage tube should be introduced into the pleural cavity, and the air allowed to enter gradually. In one of the cases in which this method was applied the preliminary operation was performed under local anæsthesia; the respirations and the pulse were accelerated, but in other respects the patient's condition was undisturbed. On the following day the tumor, together with the other ribs to which it was attached, was resected. The wound was partially closed, and drainage introduced; this was removed on the third day, and the wound closed. The lung expanded completely in about two weeks.

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[1] Centralblatt f. Chirurgie, 1902, No. 3.

INFECTIOUS DISEASES, INCLUDING ACUTE RHEUMATISM, CROUPOUS PNEUMONIA, AND INFLUENZA.

BY JAMES B. HERRICK, M.D.

DIPHTHERIA.

Nasal Diphtheria. Rhinitis is, according to Neumann,[1] oftener than supposed due to virulent diphtheria bacilli. The symptoms are variable, often mild, frequently overlooked, and there need be no membrane as in rhinitis fibrinosa. Since both the fibrinous rhinitis and the non-fibrinous form just mentioned are due to the diphtheria germ they should be spoken of as nasal diphtheria, with or without membrane, as the case may be. The importance from a prophylactic point of view of recognizing these cases is self-evident. Bacteriological examinations should be made in all doubtful cases, serum treatment instituted, and segregation instituted to avoid the spread of the disease. So far as the course of the disease is concerned, the so-called pseudodiphtheria bacilli are without significance.

Postscarlatinal Diphtheria and Rhinorrhœa and Otorrhœa. Egerton H. Williams[2] has studied the question of diphtheria as it appears during or following scarlet fever. While the number of cases has not decreased since the introduction of antitoxin, the mortality has materially lessened, falling from 43.8 per cent. in 1892 to 14.2 per cent. in 1895, and 2.5 per cent. in 1899. Basing his figures upon the reports of four metropolitan asylum boards, whose cases of scarlet fever average about 15,000 annually, he finds that about 5 per cent. of this number have postscarlatinal diphtheria. Children convalescing from scarlet fever, especially in hospital practice, are without doubt peculiarly susceptible to the invasion of the diphtheria bacillus. Not only is the mucous membrane of the throat liable to become infected, but also that of the nose, and to a lesser degree the surfaces about the external auditory meatus excoriated by discharge from the ear. Infection, then, with the germ of diphtheria is more liable to occur as the scarlet fever patient is convalescing, is up and about, mingling with other children.

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[1] Centralblatt f. Bakt., Abtheilung I., xxxi., No. 2.

[2] British Medical Journal, December 21, 1901.

The greater danger of the spread of the disease is thus clearly seen. Isolation of all cases of pharyngeal diphtheria would, of course, be quickly instituted. Williams urges, in addition, that cases of rhinorrhœa and otorrhœa, particularly if these complications have occurred during convalescence, should be isolated, examined bacteriologically, and regarded as suspicious cases of diphtheria. In observations that he has made extending over a period of a little less than four months he has met with diphtheria bacilli in 57 cases of rhinorrhœa out of 141. In 62 otorrhœas the Klebs-Loeffler bacillus was found 8 times. The importance of these observations is self-evident. Not only is the affected child given the antitoxin early enough to prevent the spread of the trouble to the pharynx or larynx and to prevent serious toxæmia, but prophylactic isolation, perhaps immunizing doses of antitoxin to those exposed, removes the danger of a spread of the diphtheria.

Diphtheria and Measles. The importance of an examination of the throat, nose, and discharging ears of convalescent scarlet fever patients has been referred to. That diphtheria occasionally complicates measles is well known. Armand-Delille[1] has found in the throats of patients with measles a bacillus morphologically like the Klebs-Loeffler bacillus, though generally less virulent. Where the germ was found to be virulent pharyngeal diphtheria or croup generally occurred. Believing the morphological diagnosis to be very difficult and the test for virulence one requiring some time, he advises that in every case of measles in hospital and private practice a prophylactic dose of serum should be given. It is doubtful if the majority of practitioners would agree with him in his rather extreme position.

Contagion from Apparently Healthy Persons. The danger that may arise from the presence of virulent diphtheria bacilli in the throat of one who does not manifest the ordinary symptoms of the disease is shown by the report of an epidemic that occurred in a children's hospital at Frankfort. Cuno,[2] who makes the report, describes how diphtheria cases sprang up in different parts of the hospital in spite of most careful measures that were adopted to check the spread of the disease. Finally, at the suggestion of Neisser, the throats of all the physicians, nurses, and other attendants who came into the wards were examined, and it was found that a nurse who had symptoms of a chronic catarrhal pharyngitis was the unwitting culprit. In her throat virulent bacilli were found. She had in her duties been assigned to various wards, and the diphtheria had promptly appeared in each ward to which she had been assigned.

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[1] Archives de Médecine des Enfants, April, 1902, Tome v., No. 4.

[2] Deutsche med. Wochenschrift, October 23, 1902.

The Value of Antitoxin.[1] The use of the diphtheria antitoxin has become widespread. Even the laity expect and demand that it be used. It may seem surprising, therefore, that space is taken to defend the use of a remedy the value of which is so generally admitted. The reason for so doing is that still there are those who are skeptical, both among the laity and among well-informed physicians. When such a man as Hueppe[2] rises in the meeting of the Prague Medical Society and declares that the whole question is yet unsettled and that the benefit comes from the fact that when the serum is used the physician feels that he has done his best, and therefore lets the harmful local treatment alone, one must admit that there is still need for further observation and argument. That the sentiment of Hueppe does not represent that of the Prague school is shown by the vigorous defence of antitoxin by Ganghofner, Epstein, Salus, Langer, and others. While speaking on the topic of the bacteriological diagnosis of diphtheria, there was a general consensus of opinion that in cases where there was doubt from a bacteriological point of view the serum should be used, and at once the sentiment of these speakers toward antitoxin was thus clearly shown.

O. Rosenbach[3] does not believe in the antitoxin. The lowered mortality is due, he thinks, to a juggling with statistics and to the fact that epidemics go in waves. Just prior to the use of the serum the epidemic was on the wane. The lowered death rate he ascribes, therefore, to the mild type of disease now for several years prevailing. Some skeptical, not to say peculiar, views concerning the pathogenesis of diphtheria are contained in the article, which is too theoretical to warrant one in abstracting it and spreading abroad these unorthodox views.

Gläser,[4] in a polemic against the serum treatment, reports two severe cases of laryngeal and pharyngeal diphtheria that recovered without serum treatment, an experience that, of course, proves nothing.

Kassowitz[5] attacks the question more soberly, and strives to prove by the absolute death rate in diphtheria that just as many cases die of the disease as before the use of antitoxin. He cites especially the figures from St. Petersburg.

A study of the charts of E. Müller or the Glasgow statistics of Brownlee, to both of which reference is made in another department,[6] will strengthen the faith of any whose belief in the efficacy of antitoxin may have been a little weak.

McCollom's figures are also convincing. From a study of more than

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[1] Progressive Medicine, December, 1902, p. 346.

[2] Prager med. Wochenschrift, April 10, 1902,

[3] Therapeutische Monatshefte, March, 1902, xvi.

[4] Die Heilkunde, April, 1902.

[5] Therapeutische Monatshefte, May, 1902.

[6] Progressive Medicine, December, 1902, p. 347.

10,526 cases of diphtheria, McCollom[1] deduces the following conclusions: 1. That the ratio of mortality of diphtheria per 10,000 of the living was very high in Boston previous to 1895. 2. That the ratio of mortality per 10,000 has been very materially reduced since the introduction of antitoxin. 3. That the percentage of mortality in the "South Department" (Boston City Hospital) is lower than that of any of the hospitals at home or abroad taken for comparison. 4. That since larger doses of antitoxin have been given the death rate has been materially reduced, this reduction having occurred in the apparently moribund cases. 5. That no injurious effect has followed the use of serum. 6. That to arrive at the most satisfactory results in the treatment of diphtheria, antitoxin should be given at the earliest possible moment in the course of the disease.

McCollom[2] also cites what seems to be a most instructive example of the value of antitoxin, especially when used early. At the Boston City Hospital two doctors and four nurses lost their lives before the days of antitoxin. In the antitoxin period there have been 134 cases of diphtheria contracted by doctors and nurses under the worst of conditions, because debilitated by hospital life. In the 134 cases there was no death, because as soon as there were any symptoms of diphtheria the patients were given 4000 units of antitoxin. McCollom also advocates intubation, the operation being done early and large doses of antitoxin being given. The advantages of the intubation are little shock, the consent of the parents easily obtained, bronchopneumonia less common than with tracheotomy. In 1200 cases of intubation the death rate was 40 per cent. Eliminating cases where death was due to diphtheritic paralysis, and moribund cases, the death rate is 25 per cent.

The same insistence upon early use of antitoxin is contained in Kerley's[3] article read before the American Pediatric Society. His tersely-put conclusions are as follows: "With visible membrane inject at once and take a culture. If croup, inject if there is inspiratory and expiratory obstruction. The patients should be seen at twelve-hour intervals. Re-inject in twelve hours if the patient is not improved or if the improvement is not marked. If continued improvement does not follow, re-inject at twelve-hour intervals until the membrane disappears. Dosage: 2000 units for a child under one year of age, the amount to be repeated if necessary. Three thousand units for a child over one year of age, the amount to be repeated if necessary."

Siegert's[4] study of diphtheria in the Children's Hospital of Vienna is another convincing proof of the efficacy of antitoxin. The statistics which he presents cover a period of five years, and include nearly eighteen thousand cases. He finds that the morbidity is practically the same as in the years before the introduction of antitoxin. He finds, also, that there is little change in the character of the epidemic; the cases seem to be about as severe as in the earlier years. But there is a very striking reduction in the mortality beginning with the years 1894 and 1895. The results which he notices are the same as those found in Germany.

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[1] Archives of Pediatrics, October, 1902.

[2] Ibid

[3] Providence Medical Journal, July, 1902.

[4] Jahrbuch f. Kinderheilkunde, January 3, 1902.

The good influence of the serum treatment is also seen in the death rate in the operated cases. No evil effects have been observed from the use of the serum, particularly the serum that has been manufactured within the last two or three years.

Jalzer[1] studied diphtheria in the hospital at Mülhauser. He finds a marked reduction in the mortality record since the use of the serum treatment. From about 50 per cent. in 1892 and 1893 it has dropped gradually until in 1900 the death rate was only 18.75 per cent. He believes that in private practice, where the physician is called early and can institute treatment more promptly, the mortality will not be as high as in the hospital, where the early treatment cannot always be carried out. He is also firmly convinced of the fact that the antitoxin treatment is the best prophylaxis against the spread of the diphtheria from the pharynx to the larynx or nose.

Fussell,[2] relying more upon his personal experience than upon statistics, is a firm believer in the antitoxin. He protests against the half-hearted administration of the remedy, urging its early use in all cases, even in the doubtful ones, not waiting for the bacteriological diagnosis. In a case of sore-throat which is doubtful in character give antitoxin at once, and make the diagnosis afterward. Cultures should always be made. The dose should be 2000 units. Repeat in six to twelve hours unless prompt improvement is seen. "Given a case of diphtheria in an early stage, it is only a matter of administration of *enough* antitoxin to effect its cure."

Josias,[3] from a study of 580 cases of diphtheria that were in the Bretonneau Hospital during the years 1901 and 1902, finds a death rate of 13 per cent. practically the same as for each of the years following the use of the Roux serum. Before this the mortality in the same hospital was 48 to 56 per cent. He urges the earliest possible use of the antitoxin in suspected cases without waiting for the bacteriological diagnosis. Prophylactic doses should be given whenever there has been exposure. He is rather severe in his denunciation of the few physicians in Paris who still express doubt as to the innocuousness or efficacy of the antitoxin. This they do, he asserts, either through ignorance or the desire to appear eccentric. A few days' service in a diphtheria ward with an observation of facts and not a rumination on theories would convince them.

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[1] Deutsches Archiv f. klin. Med., Band lxxiii. p. 555.

[2] Philadelphia Medical Journal, October 25, 1902.

[3] Bulletin de l'Académie de Médecine, October 7, 1902, xlviii., No. 31.

Holt[1] reports a case that to him was a most convincing demonstration of the value of antitoxin in diphtheria. A case of *conjunctival diphtheria* improved promptly under the serum treatment, a complete cure being wrought in a case that formerly under any treatment known would almost inevitably have gone on from bad to worse, ending in the destruction of the eye.

PROPHYLACTIC USE OF ANTITOXIN. The value of preventive treatment by the diphtheria antitoxin is well shown in an endemic of diphtheria that broke out in the Salpêtrière in 1900, and is described by L. Mathé.[2] The number of those attacked was steadily increasing, when, on the ninth day, preventive inoculations were made on all those in the wards who had not yet acquired the disease. Other prophylactic measures, as disinfection of the rooms, etc., were practised. But four new cases developed, two on the day following the injections of antitoxin where presumably infection had already occurred, and two in four days, the disease being of a very mild type. While nothing new is added by this report, it is worth while to have these facts reiterated for the report of experiences like these serves to strengthen the physician who has to handle diphtheria in a crowded tenement or in a hospital, and who feels the responsibility thrown upon him of preventing so far as possible the spread of the disease to healthy persons in the house or immediate neighborhood.

How strongly the French feel on the subject of the serum treatment is shown not alone by Netter,[3] who advocates the prophylactic employment of serum in schools and hospitals where a case of diphtheria has appeared, but by resolutions passed by the Academy de Médecine.[4] These resolutions declare the harmlessness of the antitoxin and insist upon its curative power. In schools, hospitals, or families preventive doses should be employed on the outbreak of diphtheria. In contagious disease hospitals, especially in the case of scarlet fever and diphtheria, prophylactic doses should be given, even though no case of diphtheria is present. This tends to avoid the too frequent occurrence of postscarlatinal diphtheria, or, what is as serious, the diphtheria with or following measles. In the latter disease larger immunizing doses are required than with scarlet fever. While 250 units may be considered an average immunizing dose, in measles it should be 500 units. Netter agrees with Heubner in this observation, and the resolutions of the Academy are to the same effect. Though greatest reliance can be placed on the serum treatment as a curative and prophylactic measure, the ordinary disinfection, hygienic measures, care of the throat, diet, symptomatic treatment, etc., should not be disregarded. It is to be remembered, also, that the effect of an immunizing dose is transitory, lasting for about three to five weeks. In exceptional cases of prolonged exposure the dose may need to be repeated. This point is well brought out by Jump,[1] who, from a study of the subject, believes that a dose of from 250 to 500 units of a reliable antitoxin confers immunity for at least three weeks. Pfingst[2] also refers to the fact that immunity is of short duration, a few weeks at the most. He thinks that immunity conferred by the injection of the antitoxin is as certain and absolute as that conferred by an attack of the disease, and that it lasts as long. He is a firm believer in the curative power of antitoxin, but warns against the giving up of other remedial agents. Local applications, cardiac stimulants, laxatives, etc., still have an important place in the treatment of diphtheria.

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[1] Archives of Pediatrics, May, 1902.

[2] Paris Thesis, 1901.

[3] Bulletin de l'Acad. de Méd., March 18, 1902.

[4] Ibid., April 8, 1902.

The words of Netter[3] and of Briggs[4] are quoted, with approval, by Neumann,[5] who advocates the more general employment of the serum as a prophylactic in schools, hospitals, and families. Not only do the lives saved warrant this free use of the serum, but he finds that when diphtheria does develop in one previously injected the disease is milder. From the standpoint of dollars and cents he figures that it is cheaper to use the prophylactic serum liberally than to take care of the larger number who would contract the disease if the immunizing dose were not employed.

THE COUNTRY DOCTOR AND DIPHTHERIA. It is sometimes thought by the country doctor that the proper treatment of cases of diphtheria can be carried on only in the city, where the bacteriological diagnosis can be properly made and where antitoxin is fresh at hand in the apothecary's shop or in the municipal station. It is instructive, therefore, to read of the results obtained by a Scandinavian doctor practising in the country where no bacteriological diagnosis was attempted. G. Sjödahl[6] treated 149 cases of diphtheria, using the Swedish serum in each instance. In 62 per cent. he was able to use it during the first two days of the disease, an eloquent proof of the confidence of the people in the efficacy of the serum, and, we might add, in the judgment and skill of their family physician. Of the 149 cases 9 died, 6.04 per cent. All of these were cases of croup. In all there were 40 cases of croup. The mortality among these was 22.5 per cent., the 9 fatal cases succumbing within twenty-four hours after the injection of the serum.

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[1] Philadelphia Medical Journal, January 11, 1902.

[2] Pediatrics, July 1, 1902.

[3] Loc. cit. and Bulletins de la Société de Pediatrie de Paris, May and June, 1901, and February, 1902.

[4] Medical News, July 22, 1899.

[5] Deutsche med. Wochenschrift, September 4, 1902.

[6] Hygeia, 1901, pp. 170 and 666; abstract in Jahrbuch f. Kinderheilkunde, May 1, 1902, p. 604.

No operative procedures were practised, sole reliance being placed on the serum, stimulants, and expectorants. It is to be noted that these figures compare favorably with those of city physicians and with the statistics of hospitals.

ANTITOXIN EXANTHEM. In Ganghofner's clinic von Rittershain[1] has analyzed 1224 cases of diphtheria treated with serum as regards the rash. This appeared in 6.45 per cent. of the cases. This is a smaller percentage than has been reported by others, and smaller than that reported by Ganghofner[2] in previous years. Rittershain believes that the greater the volume of the serum the greater the liability of the occurrence of the rash. The improvement in the method of manufacture—the smaller bulk now employed—accounts for the lessened frequency of the exanthem. Different makes of antitoxin differ in their tendency to cause the rash. Twenty-two times out of the eighty-one the rash was local, in twenty instances appearing before the tenth day. The average duration of this local rash was one day. In 57 cases the rash was general. Twice the time of appearance was the first day after the injection, once it was the sixteenth day, oftenest—37 cases—it was between the third and seventh days. No instance of the exanthem delayed until the third or fourth week was seen. This delayed rash has been reported by others, however. These general rashes lasted anywhere from a few hours to five days. Fever was occasionally seen, especially with the scarlatiniform eruption. In only 1 case was there swelling of the joints; in 4 there was swelling of the eyelids. Morphologically, the eruptions were classed, according to Hartung's divisions, into urticaria, 31 cases; erythema, 2; scarlatiniform, 10; morbilliform, 6; mixed or multiform, 5. Great difficulty was experienced in determining the true nature of the serum rashes that resembled scarlet fever. The occurrence of nephritis and of desquamation not infrequently showed that the earlier diagnosis of serum exanthem was wrong. Rittershain, therefore, advises that unless a mixed infection with true scarlet fever can be ruled out of the case of diphtheria that has been treated with the serum, the case should be regarded as a suspect and treated as one of scarlet fever. This caution is certainly a wise one, particularly in contagious disease hospitals, where segregation according to diseases is attempted. The necessity for the "suspect" room or rooms is only too apparent the moment one attempts to do actual work in such a hospital and realizes the danger of admitting a doubtful case of one contagious disease to a ward containing patients suffering from another. A child free from any serious disease may be needlessly exposed, or the child just entering may be the means of infecting an entire ward with an entirely different malady.

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[1] Jahrbuch f. Kinderheilkunde, May 1, 1902.

[2] Pentzoldt' und Stintzing's Therapie, I. Supplement band.

Pilocarpine in Diphtheria. Saunders[1] advocates the use of pilocarpine in connection with the antitoxin, or, rather, before the antitoxin, upon the appearance of any suspicious looking exudate in the throat. While this method of treatment may serve to loosen a pharyngeal membrane, the use of pilocarpine in doses sufficient to produce the full physiological action seems to me dangerous on account of the general depressing action of the drug. Cardiac depressants in diphtheria do not seem rational.

Intubation and Tracheotomy. Ganghofner[2] discusses the relation of intubation to tracheotomy in connection with the serum treatment of the disease. His study is in a large measure statistical. He contends that statistics are more or less unreliable as the basis of conclusions unless all the attending circumstances are critically analyzed. Thus the mortality tables fail to take into account the prevailing character of a given epidemic, which, good or bad, may modify materially the results of a tracheotomy or an intubation. In many cases, too, the stenosis is perfectly relieved by the operation, the death being due to toxæmia or to some complication, yet the death is generally credited to the operative procedure. Ganghofner has a decided preference for intubation unless there are special contraindications, such, for example, as marked pharyngeal œdema. Yet he stands ready in all cases to do a tracheotomy in case the intubation is found to be insufficient. "What harm can there be in the attempt to relieve by intubation when one stands ready to do a tracheotomy as soon as the effect of the intubation is seen to be unsatisfactory" (p. 533). He is, also, one of those who has little fear of the pressure necrosis, with resulting scar from wearing the tube for a long time. Many of his cases have carried the intubation tube from two to four weeks. It is, of course, understood, that in all these cases the antitoxin is also employed.

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[1] St. Louis Courier of Medicine, April, 1902.

[2] Jahrbuch f. Kinderheilkunde, May 1, 1902.

DYSENTERY.[1]

The separation of the dysenteries into two classes—the specific, due to Shiga's bacillus, and the amœbic—has been more clearly and definitely made during the past year.

Specific or Epidemic Dysentery. Shiga[2] has given a résumé of his work on epidemic dysentery. Naturally this deals largely with the bacteriological aspect of the question, and much that Shiga has previously written and that has received notice in earlier volumes of PROGRESSIVE MEDICINE is repeated. The bacilli are usually found in the fresh stools by the end of the first week, and may be in almost pure cultures. They are present in every case, but are not found except in connection with dysentery. The lower the intestinal lesion the more readily are the bacilli found in the dejecta. In relapses they reappear. They were never found in the liver, spleen, urine, blood, or milk, though often in the swollen mesenteric glands. The agglutination test with the serum of dysenterics was positive in dilutions varying from 1 to 10 in mild cases to 1 to 130 in severe ones. Agglutination begins in the second or third week, and is therefore of little diagnostic value, though prognostically a sudden appearance of, or rapid increase in, agglutinating power in the serum is to be regarded as more favorable than the slow appearance.

Shiga's results in the line of serum therapy are favorable both in man and lower animals. From an experience with 510 cases he believes the early use of his serum causes quick recovery or at least a milder course. Even when used later in the disease he noted an improvement in the symptoms. The mortality he believes is from one-third to one-half what it is by medicinal treatment alone. The prognosis depends largely on the location of the inflammation. The higher in the intestine the lesion the graver the outlook. Cathartics, such as calomel and castor oil, together with enemata of various kinds, can be employed, with advantage, and probably tend to prevent the ascent of the process in the bowel.

That epidemic dysentery wherever found is one and the same disease is the opinion advanced by several writers. Shiga himself in the article just quoted states that he has identified the organisms sent him by Flexner and by Kruse as similar in all essentials to his, a conclusion also reached by Flexner.[3] The bacillary dysentery, then, as found in Japan, Manila, and Germany appears to be due to the Shiga bacillus.

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[1] PROGRESSIVE MEDICINE, December, 1902, p. 41.

[2] Deutsche med. Wochenschrift, 1901, Nos. 43–45.

[3] University of Pennsylvania Medical Bulletin, August, 1901.

The evidence also accumulates that sporadic and institutional dysentery are but modified forms of the same disease, and are due to the same germ. Vedder and Duval[1] studied cases from places widely separated in the United States, using for diagnosis and control, cultures obtained from Shiga, Flexner, Kruse, and Strong. They regard the bacillus isolated by them from these cases of acute dysentery as identical with that found by Shiga in Japan, Kruse in Germany, Flexner and Strong in the Philippines. Not only do they regard the acute dysentery in the United States as due to a bacillus indistinguishable from that obtained from the epidemics of dysentery in several other parts of the world, but they believe it is proven that the sporadic and institutional outbreaks of acute dysentery are caused by the same organism, viz., the bacillus dysenteriæ Shiga. In England, too, Foulerton[2] tested the agglutinative reaction with the serum of patients suffering with dysenteric symptoms, using Flexner's bacillus. Some of these patients had become sick in little outbreaks in England, one in China, two in South Africa, etc. Positive results were obtained in all save one, a case that was regarded on clinical grounds as well, as non-dysenteric. It must be said, however, that Kruse[3] as late as June, 1901, maintained that the identity of these forms had not been established. He says: "In the insane hospitals dysenteric-like diseases occur that have nothing whatever to do with the genuine epidemic dysentery, though they are apparently due to closely related bacteria, among which we can distinguish several types."

It is to be hoped that the attempt will be made in all cases of dysentery to make an etiological diagnosis rather than one based on purely clinical or pathological grounds. The necessity for this is seen when we read that Mott,[4] in a paper on asylum dysentery, says that the disease presents six or seven different clinical and pathological types, though he regards it as the same dysentery described by Sydenham, Willis, and by Baly at Millbank Prison. If viewed from the etiological standpoint and looked at as due to a single organism, the tendency will be toward unity, simplicity, and fewer clinical and pathological groups. Washbourn[5] describes the dysentery as seen in South Africa as non-amœbic and of varying types, which he groups into (1) a short, mild, afebrile form; (2) a typhoid-like form with a course of two or three weeks; (3) the common form, with acute onset, colicky pains, blood, mucus, tenesmus, fever, and lasting about one week.

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[1] Journal of Experimental Medicine, vi., No. 2.

[2] Centralblatt f. Bakteriologie, xxxi., No. 5.

[3] Deutsche med. Wochenschrift, 1901, No. 24, p. 388.

[4] Referred to by Rolleston. Practitioner, March, 1902, p. 342.

[5] Clinical Journal, August 28, 1901.

Aside from the serum employed by Shiga no treatment is regarded as at all specific. Yet Shiga encourages the washing out of the bowels by laxatives or enemata. Richmond[1] advocates sulphur, twenty grains, given with five grains of Dover's powder, every four hours. Lillie,[2] like Shiga, believes in flushing out the bowel by injections or magnesium sulphate. Stoney[3] advised enemata of two ounces of water containing twenty minims of tincture of opium, with one drachm of powdered ipecacuanha.

COMPLICATIONS. Remlingen[4] refers to some of the rarer complications of dysentery. Among these he mentions *acute nephritis* and an *œdema* without albuminuria that is occasionally seen after the severer or more prolonged attacks, possibly explainable on the hydræmic state of the patient. Elimination through the kidney is often impaired, as shown by a diminution in the amount of urea and of total solids. A non-suppurating *synovitis* is not uncommon. This arthritis during dysentery is mentioned by many writers. Rolleston says that in the dysentery in South Africa *arthralgia* was not rare, especially during convalescence. He cites a Parisian case reported by Claude in which the joint pains that were believed by Claude to be due to dysentery preceded the intestinal symptoms. Among other complications mentioned by Remlingen are *splenic abscess*, *epididymitis* (two cases), and *phlebitis*. The latter complication, I believe, is not as rare as the splenic abscess and the epididymitis, the latter of which has probably not been previously recorded.

Amœbic Dysentery. Ucke[5] refers to an article published in the *St. Petersburger med. Wochenschrift*, 1901, Nos. 25 and 26, to show that Jaeger,[6] writing later, overlooked this article written by Kernig and himself. He adds, also, that injection of amœba-containing stools into the rectums of young cats has proven positive in so far as the exciting of a diarrhœa with the continued presence in the stools of amœbæ is concerned. Death of the kittens occurred from inanition. No ulcers were found. Ucke calls attention to the fact that the various pictures presented by different cases of amœbic dysentery may be due to varying virulence of the amœbæ, to greater resisting power of the individual, or to varying local conditions. It is a well-known fact that amœbæ may be harbored in the intestine for a long time with few or no symptoms whatever.

Shiga[7] gives the following differential diagnostic points for amœbic and epidemic dysentery:

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[1] Lancet, 1901, vol. ii. p. 1408.

[2] British Medical Journal, 1902, vol. i. p. 199.

[3] Ibid.

[4] Revue de Méd., October 10, 1901.

[5] Centralblatt f. Bakteriologie, xxxi., No. 7, p. 317.

[6] Berliner klin. Wochenschrift, 1901, No. 36.

[7] Deutsche med. Wochenschrift, 1902, No. 45.

1. Amœbic dysentery is generally chronic.
2. In amœbic dysentery the bacillus is not found.
3. In amœbic dysentery toxic symptoms are lacking, as fever (except when abscess of the liver or pyæmia is present), general depression, anorexia, rapid emaciation, hemorrhoids, and nervous symptoms.
4. In amœbic dysentery abscess of the liver is common.
5. In amœbic dysentery the lesion is limited to the rectum and ascending colon.
6. In amœbic dysentery the force of the destructive process is spent on the submucosa, and the ulcers have undermined edges; in the epidemic form the process is especially marked at the summit of the folds of the intestine.

Shiga's experience with the amœbic dysentery has been limited to seven cases. Some of his statements will probably be modified by himself later. While amœbic dysentery is commonly chronic, yet not a few exquisitely acute cases are seen. Also, fever is sometimes present, and the constitutional symptoms, including marked and rapid emaciation, may be pronounced.

It has been contended by some that the name dysentery be restricted to the epidemic form and that the amœbic form be called amœbic enteritis. This is the burden of an article by Zorn.[1] He complains that Kartulis, in his article on "Dysentery" in Nothnagel's *System*, seems to have a partiality and to regard amœbic dysentery as the only important form, and treats the epidemic dysentery in a "stepmotherly" manner. The two forms are distinct, and he thinks should be given different names. Zorn inclines to the view that there is more than one kind of amœba at fault in cases of dysentery. In the case he reports the amœba corresponded to the first group of Quincke and Roos, the amœba coli felis. He was unable to cultivate it, though trying various media. He makes one interesting observation on the influence of *quinine* on the amœba. In the watery solution of quinine employed for irrigation of the bowel he found living amœbæ even one or two hours after the water had been returned from the bowel. He offers as a possible explanation the fact that the effect of the quinine is, perhaps, interfered with by the bits of mucus in which the amœbæ are so often embedded and by which they are perhaps protected.

Ludwig Ebstein[2] in a case of acute dysentery found amœbæ in the stool, and succeeded in cultivating them even to the fifth generation in hay infusion. The cultures, however, were not pure, numerous other organisms being present. In one experiment on a cat the amœbæ were found in the stools for several days. The autopsy on the marasmic cat showed intestinal ulcers, though no amœbæ. Ebstein regards this amœba as the specific cause of the dysentery in this particular case, and calls attention to the morphological similarity between it and those described by Quincke and Roos. Without more positive results, however, in the way of cultural experiments, the exact causal relation of the amœba to dysentery must remain unknown. In Ebstein's case it was a striking fact that the more pronounced the symptoms of the disease the more abundant were the amœbæ, and that as the disease subsided the amœbæ disappeared.

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[1] Deutsches Arch. f. klin. Med., Band lxxii. p. 366.

[2] Arch. f. Exper. Path. u. Pharmak., Band xlvi. p. 448.

Dock[1] reports a case of amœbic dysentery in a farmer, aged thirty years, who had not been out of the State of Michigan in eight years. The symptoms dated back only four months. The source of the infection, therefore, would appear to have been in Michigan. Dock knows of no other case of amœbic dysentery that has been recognized in Michigan. He reviews the question of the history, nomenclature, and microscopic recognition of the amœba coli, and urges that still further study in cases of this class is necessary, and that American investigators might profitably continue the work already done by Councilman and Lafleur, and by Flexner.

Amberg[2] discusses *amœbic dysentery in children*, giving details of five cases. These were of moderate severity. In none was there hepatic abscess, which is rare as a complication in children. In these cases attention was paid to the presence of Charcot-Leyden crystals. In four these crystals, together with eosinophilic cells, were found. The relation between them and the amœbæ does not seem clear. Anæmia was present in all cases, the blood being of the chlorotic type. There was no striking leucocytosis. Stools of other children with diarrhœal discharges failed to show amœbæ.

THE FOURTH DISEASE.

Without going into the details reference may be made to the experience of P. Watson Williams[3] with thirty-two cases of *German measles*. Some of these cases he feels sure would, if occurring under any other circumstances than those of an epidemic of rubella, have been called by Dukes examples of the fourth disease. Some were like measles; one much like scarlet fever. Though these cases, resembling the fourth disease, were allowed to mingle freely with the other boys in the school who had unquestioned German measles, no transference of the disease from one to the other occurred. It appears to Williams, therefore, that in these cases at least, there was no fourth disease, even though the appearances were suggestive of it, but that all were suffering from rubella. He also describes some cases of scarlatina resembling rubella where a resemblance to the fourth disease might easily lead one to regard the cases as other than scarlatina. Williams is inclined to question the existence of the fourth disease, and feels that more proof is necessary before one can accept it as a clinical entity.

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[1] Journal of the American Medical Association, September 13, 1902.

[2] Johns Hopkins Hospital Bulletin, December, 1901.

[3] British Medical Journal, December 21, 1901.

Pleasants[1] reports an epidemic of *scarlet fever* in the Home of the Friendless, in Baltimore. Mild and atypical cases were seen, some of which answered well the description of Dukes' fourth disease. From his study of the question, Pleasants feels justified in concluding that Dr. Dukes has not succeeded in establishing the existence of a new exanthematous disease; that under the so-called "fourth disease" he has included cases of undoubted scarlet fever and probably, also, cases of rubella; that in certain epidemics scarlet fever may present an atypical picture with many of the classical symptoms absent, rendering a diagnosis difficult or impossible in isolated cases.

Claude R. Ker[2] reviews the symptomatology of scarlet fever, measles, rubella, and Dukes' fourth disease. He finds no proof of the existence of the latter. He believes Dukes' disease can be explained as mild scarlatina or as atypical rubella. He regards Dukes' case as "not proven."

MALARIA.

The work that has been done on malaria during the past year has been largely in the nature of a confirmation of work previously done. The relation between the mosquito and malaria seems to be firmly established. Occasionally a skeptical voice is heard, but there is quite a general acceptance of this view. So firmly is it believed, that communities and even national governments are looking into the question of abolition of malaria from an economic point of view. To this end they are investigating the best means of destroying the mosquito or of preventing its attack upon man. Some new points in the life-history of the parasite and of its development in the mosquito have also been discussed. Not a few communications have been made during the past year upon the subject of "black-water fever." The general impression seems to be, as will be shown by a few abstracts which I will give, that there is a relation between the administration of quinine and the hæmoglobinuria.

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[1] Philadelphia Medical Journal, May 24, 1902.

[2] Practitioner, February, 1902, lxviii., No. 2.

As is well known, the work of the Italians on the subject of malaria has been most extensive. Not only have they gone at it in a scientific spirit, and investigated with a carefulness and persistence that is praiseworthy, but they have shown a loyalty and patriotism that command admiration. Their society for the investigation of malaria has already made notable contributions to this important subject. Their work has been systematized, too, in a manner that could well be imitated. The country has been divided up into districts; competent physicians have been appointed as observers in these different districts, and these report to headquarters. The combined reports have, therefore, had an unusual value, and they have not lost sight either of the importance of malaria to the economic development of the country. Such books as that of Celli, published a short time ago, show the enormous loss of life that occurs in Italy every year, some 15,000 dying annually of malaria, and show that many more thousands are sick with the disease, so that the State loses their productive value, and that thousands of acres of arable soil have become practically uninhabitable because of malaria. The practical side, therefore, of malaria, as well as its purely scientific side, has been constantly kept at the front by the work of the Italians who have devoted much time to the consideration of the best plan to eradicate the disease.

Celli's Résumé. Celli[1] gives a résumé of the work of the year 1901 done by the Italians. His report is under three heads: first, the epidemiology; second, the pathology, and third, the prophylaxis. He shows how many new stations have been established during the past year for the study and observation of the disease. The epidemic of 1901 was in general milder than that of the preceding year. The tertian parasite, as a rule, produces a fever of a light type. The æstivo-autumnal parasite seems to vary more in its virulence. In the north of Italy the fever, as a rule, is of a milder type; in the south of Italy of a severer type, the mortality being much higher. In the south of Italy the æstivo-autumnal form is much commoner than in the north. In central Italy both the milder tertian and the severer æstivo-autumnal forms of the disease are met with. The quartan is rarer, and seems to be rather uniformly distributed throughout Italy. The recurrences after long intervals, and even where cure is supposed to have taken place, are one of the most characteristic features of malarial fever. The anopheles is never absent where malaria is present, and yet there is no relation between the number of mosquitoes found in a locality and the number of cases of malaria. Many places were found, especially in northern and middle Italy, in which the anopheles abounded, and yet cases of malaria were not present, at least in epidemic form, though patients with malaria kept coming and going, and occasionally sporadic cases would crop out. Celli says there is no definite explanation of this phenomenon, and it needs further investigation. So, also, further investigation is required as to the relation of malaria to the cultivation of rice and the maceration of flax. There is some evidence to show that the latter industry rather tends to lessen than increase malaria.

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[1] Centralblatt f. Bakt., Parasit. u. Infek., I., May 14, 1902, vol. xxxi., No. 16.

As to seasons, the mild tertian form is commonly found in the spring or at the beginning of an epidemic; the æstivo-autumnal fever in the summer and autumn; the quartan is more commonly found in the fall. There is still room for investigation of the relation between the infection of the mosquito and the appearance of malaria as an epidemic. The yearly periodical variations of the disease, its occasional pandemic appearance, must be investigated, and especially the disappearance and reappearance of malaria where the local and "anopheletic" conditions remain unchanged.

Regarding the *pathology* of the disease, Celli states that Dr. Caccini believes that he has found a true quotidian fever with its parasite, the same probably that has been previously observed by Marchiafava and Celli. Efforts are being made, also, to find a more certain method of diagnosing the latent and recurrent forms of malaria, which would help very much in the rational treatment and cure of the fever. No definite results, however, have yet been obtained, although attempts have been made with the newest and most accurate diagnostic methods, including the agglutinative and hæmolytic powers of the blood serum.

As regards the *prophylaxis*, while malaria is controlled by quinine, still, all who have had experience know that it is a very difficult thing to stamp out malaria over any extensive territory by the use of quinine alone, or of quinine combined with iron and arsenic; still, for the treatment of individuals, and particularly those who are to be in a malarial district for a short time only, as, for instance, the farm hands during the harvest time, daily doses of quinine should be given. Not only this, but employers of men should be compelled by the State to furnish quinine free to employés when engaged in work that exposes them to malarial infection. The hydrochlorate of quinine is strongly recommended by Celli, and this, he believes, is a prophylactic that is superior to the combined quinine, iron, and arsenic. The mechanical protection of people against the mosquito has had some excellent results. People in malarial districts have been protected by screened houses, and out of nearly 5000 persons only 1.9 per cent. contracted malaria. Among those where the houses were poorly protected against mosquitoes about 10.9 per cent. contracted the disease. Many families, Celli declares, through purely mechanical prophylaxis have been awakened, so to speak, to a new life.

Celli closes his review by pointing with pride to the excellent results obtained by this society for the investigation of malaria, and also states that the work has been done at a minimum expense.

The Mosquito and Malaria.[1] I have just referred to the fact that the Italians have observed in many localities that the mosquitoes of the genus anopheles abound, and still malaria is not present. This fact has been reported by many other observers from different parts of the world. Thus Robin[2] finds that Delaware is free from malaria, though he finds that the anopheles is present in some regions where malaria is not met with. This same condition is described by De Francesco,[3] who found in certain parts of Calabria, where he had spent three years, that there were territories in which the anopheles were present, but no epidemic appearance of malaria was manifest. This, with some other facts, has led Francesco to be rather skeptical regarding the rôle played by the mosquito. He does not believe that the anopheles is the only means of conveyance of malaria to man. Further, he believes that it is possible for the genus culex to convey the parasite, as in some severe epidemics he has found the culex present in larger numbers than the anopheles. He is inclined to cling to the old soil theory of the origin of malaria, though not denying that the mosquito may have something to do with the development of the disease. His argument, however, is certainly not conclusive, and is rather the expression of a belief than a presentation of any proof. While we do not know all the conditions that tend to produce malaria in a given district at a given time, it is not right to deny the relation of the mosquito to the disease merely because the disease is not always present when the anopheles most abound. Using the same argument one could deny the relation that exists between the diphtheria bacillus and diphtheria, or between the pneumococcus and pneumonia, because at certain times and under certain conditions, even though diphtheria bacilli or the pneumococci are present in large numbers, there is no epidemic of one or the other disease.

Sergent[4] has also made the observation that in certain places near the mouth of the Seine the anopheles is present and still malaria does not exist.

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[1] PROGRESSIVE MEDICINE, December, 1902, p. 297.

[2] Bulletin of Bacteriological and Pathological Laboratory of the Delaware State Board of Health, vol. x. pp. 4–9.

[3] Semaine Médicale, 1902, No. 20.

[4] Annales de l'Institut. Pasteur, October 25, 1901, Tome xv.

At the Congress of Russian Physicians, held this year, in Moscow,[1] the question of malaria was discussed, and Argutinski expressed some plain, and, to a certain extent, radical views regarding malaria. According to the abstract of his article, he declares that the present methods of examination give for the most part only artefacts. Therefore, no definite knowledge has yet been obtained concerning the parasite, for no methods are known that disclose to us unchanged the vital structure of the parasites, and physicians are very little acquainted with zoological facts concerning sporozoa and coccidia. Again, medical terminology is entirely unscientific, and does not correspond at all with the zoological terminology. The parasites in malarial disease are not within the red corpuscle, but rather upon its surface. He believes that the asexual growth of the parasite occurs in man, but the sexual cycle in the bodies of mosquitoes. That Russia is a favorable country for the study of malaria is shown by the statement made by Favre,[2] who, unless he is misquoted, declares that yearly in Russia there are 3,300,000 cases of malaria, occurring chiefly in the southern outlying territory in the Caucasian-Turkestan region. The importance, therefore, to Russia of careful prophylactic measures, such as obtain in Italy, is plainly to be seen.

Most observers, as has been said, can see the direct connection between the presence of anopheles and the development of malaria. Thus, Billet,[3] making observations among the troops in the garrisons in Constantine, finds a correspondence between the appearance of anopheles and the development of malaria.

Schoo,[4] also, making observations in North Holland, and collecting information from many physicians, not only finds malaria in his locality, and apparently increasing, but traces a direct connection between the anopheles and the malaria.

In the Island of Hokkaido or Jeso, in the northern part of Japan, Tsuzuki[5] has investigated the malaria that has been more or less epidemic, and particularly in the neighborhood of the rice fields. He finds the tertian parasite only. The variety of the anopheles that is present differs from any known to him, and he gives to the mosquito he describes the temporary name anopheles Jesoensis. He performed an interesting and conclusive experiment showing the transmission of malaria by this particular kind of mosquito. Permitting several to bite a patient whose blood contained the tertian parasite, these were taken to a distant place where malaria was unknown, and, after fifteen days, permitted to bite a person who had never before suffered from malaria and whose blood was free from parasites. Typical malarial paroxysms followed in one week, and plasmodia of the same kind as were present in the first patient's blood were found in the blood of this second patient. Under quinine recovery followed. Tsuzuki has also followed the sexual cycle in the mosquito.

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[1] Abstract in Centralblatt f. Bakteriologie, April 23, 1902, I. Band xxxi., No. 14.

[2] Ibid.

[3] Gazette des Hôpitaux, 1901, No. 108.

[4] Weekblad van het Nederkansch Tidschrift, Voor-Geneeskunde, 1902, No. 4.

[5] Centralblatt f. Bakt. Originale, June 18, 1902, I. xxxi.

Prophylaxis. F. Plehn,[1] whose previous work on malaria has been so well received, shows that the scientific investigator can be combined with the practical man. His long article on the practical side of malaria is of special interest to Americans, now that our colonial possessions and closer relations with tropical countries bring us more nearly face to face with the problems of malaria and other tropical diseases. I use nearly the same language I employed in a notice elsewhere of Plehn's article.

Plehn takes it for granted that the plasmodium is the cause of malaria and that the disease is communicated to man by the bite of the mosquito. In his observations he recognizes the larger pigmented form of parasite, with intermittent course, and a smaller form, with sparse pigment corresponding in its morphology and clinical manifestations to the æstivo-autumnal parasite. The value of blood examinations is not underestimated, and the experienced physician can in this way not only tell the variety of malaria, but can predict the time of the next paroxysm. Yet, clinical manifestations generally enable one to make an accurate and positive diagnosis. Long-continued paroxysms of fever in the æstivo-autumnal form speak for double or multiple infections.

There is only one curative agent—quinine. To employ any other, except, perhaps, euquinine, is a waste of time. While possibly the "black-water fever" is precipitated by quinine, Plehn is explicit in advocating quinine in all cases of malaria, warning against the possible occurrence of hæmaturia in much the same way that one warns against the possible development of nephritis after scarlet fever or neuritis after diphtheria. After recovery from malaria quinine should be given in weekly doses of fifteen grains, or, better, in eight-grain doses every five days. This prevents relapse, but does not confer immunity.

The negro inhabitants are practically immune. Yet, Plehn finds, as did Koch, that the blood of negro children often contains the parasite, and the children, if they are carefully watched, will be found to have splenic enlargement and slight fever—*i. e.*, mild manifestations of malaria. They are by this mild attack rendered immune against future attacks, as they are born relatively immune because of hereditarily transmitted tendencies. Europeans, however, lacking any hereditary immunity or any that is acquired through mild malaria in infancy, readily fall victims to the severe forms of the disease. The comparison is very aptly made between the behavior of the black toward malaria and the white toward measles. It is well known that when communities where this latter disease has not appeared are infected with measles, old and young alike are stricken with a most severe and malignant type of the disease. Through centuries of contact with measles the white man is relatively immune. Plehn suggests that immunity against paludism might possibly be artificially conferred by purposely inoculating individuals by means of the bites of infected mosquitoes and permitting only a mild form of malarial fever to develop by giving small doses of quinine. Experiments along this line are justifiable.

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[1] Deutsche med. Wochenschrift, xxvii., Nos. 46, 48, 49.

Prophylaxis by means of screening windows, wearing clothing that protects the body from the bites of insects, remaining in-doors after sundown, and keeping away from districts known to be infected, should be rigidly advised and, if necessary, enforced by law on sailors and Europeans. One may judge of the susceptibility of the European to malaria by reading Plehn's statement that if 100 Europeans were to attempt to acquire immunity, permitting themselves to be inoculated by the bites of infected mosquitoes, and if they were not to take quinine, out of this 100 at least 90 would die, and 9 would be left in a wretched condition of weakness and debility, while 1, perhaps, would pass through the ordeal unharmed.

From the experience of this observer one sees how necessary is the attention to the details of prophylaxis, how dependence is still upon quinine, how important from an economic point of view is the doing away with this scourge of the tropics, and how there are still many problems of scientific interest that still remain to be solved and whose solution will be of immense value. A vaccination against malaria is the great desideratum of the tropical world.

Views that are quite similar to those of Plehn and the Italians concerning the measures that should be instituted to ward off and to eradicate malaria are expressed by Birdwood.[1] He emphasizes the value of drainage of stagnant water, screening of houses, use of quinine, etc.

An observation that is of interest and may lead to important results is that of Perrone.[2] He has found that the larvæ of anopheles do not develop in flowing water, nor do they seem to live in water that contains no vegetation. They do not thrive in water that contains sulphur or salt, nor in the vats used in the maceration of hemp. On the contrary, they flourish in stagnant water, whether pure or dirty, whether it is acid, alkaline, or contains chalk or iron. They flourish particularly well in water that is rich in vegetation. The larvæ of culex show similar peculiarities, though they appear to develop well in the vats used in the maceration of hemp. If these observations are true, prophylaxis may in many localities be readily established by rendering the water salt, as by mixing with sea water, or, more simply, by making stagnant water running, or freeing the water from vegetation. The same relation of the larvæ of anopheles to salt water has been found by Ficalbi.[1] In several places he found that the origin of the malaria was in small pools or ditches of stagnant fresh water, though at first sight it seemed as though the parasites must have developed in the salt water. Better schemes of canalization and better drainage seem to him a solution of the problem.

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[1] Indian Medical Gazette, March, 1902.

[2] Annales d'Igiene Sperimentale, Nuova serie, 1901, Fasc. l. vol. xi.

Galli-Valerio[2] has seen the good effects of drainage, the use of quinine, and the mechanical protection against the mosquito in blotting out malaria. Prophylaxis, he concludes, consists in better drainage, cleansing of existing canals, the general use of quinine, and its free distribution to the poor, with possibly the use of mosquito netting or screens, and the bettering of economic and hygienic conditions, for malaria, like other diseases, by choice attacks the body when it is weak. Galli-Valerio is one of those who is a firm believer in the relation existing between the anopheles and malaria, for, while he does not claim that the presence of anopheles always indicates the presence of malaria, he does claim that in no malarial epidemic has the anopheles been found absent.

The tendency for malaria to appear when patients are more or less run down, and to which Galli-Valerio refers, is a matter of frequent observation. It is during the convalescence from typhoid fever that malaria is liable to crop out. Curry,[3] in his report on the fevers of the Philippines, says that in many of the convalescents from acute diseases, also in many of the soldiers who had been wounded malaria developed; and Freeland[4] believes that in malarial districts quinine should be given after any severe operation, to prevent, if possible, the occurrence of malaria while the patient is depressed from the effect of the operation. Albert Plehn[5] also directs that in the tropics where prophylactic doses of quinine are taken every few days, an extra dose should be taken after a long march, after an injury, or after exposure to cold and wet.

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[1] Annales d'Igiene Sperimentale, Nouva serie, 1901, Fasc. l. vol. xi.

[2] Atti per la Société della Malaria, 1902, vol. iii.

[3] Boston Medical and Surgical Journal, 1901, No. 19.

[4] Indiana Medical Journal, December, 1901.

[5] Archiv f. Schiffs und Tropen Hygiene, 1901, Band v., No. 12.

An excellent example of the benefit of mechanical protection against the mosquito is that afforded by the Sardinian Railway. Fermi and Cano-Brusco[1] report how, by careful screening of the railway stations the ticket office and the houses for railway employés, together with rigid enforcement of regulations regarding the wearing of a protecting cap and gloves after sundown, no cases of malaria developed in the protected houses, though in others that lacked protection malaria appeared. The dwellers in the houses after their experience were much gratified at having been free from "fever, gnats, flies, and other insects," and, while undisturbed at night or day, also had air and light.

Abdominal Pain in Malaria. Abdominal pain as a striking and at times misleading symptom in malaria has been considered by Ford,[2] who calls attention to the possibility of its close resemblance to appendicitis. Capps[3] has also reported cases in which abdominal symptoms, and, in particular, pain were confusing, and where the blood examination gave the sure clue to the diagnosis. Jackson[4] discusses the same general subject. Wolf[5] finds that a latent malaria may be aroused to activity by an appendicitis, and also that malaria, with right iliac pain, may be mistaken for appendicitis.

Black-water Fever.[6] The black-water fever has attracted a good deal of attention. I will not attempt to give abstracts of all the articles that have appeared. The general trend of the discussion of the subject has, however, been to support the observations of many physicians who have practised in the tropics, and to confirm Koch's statement, that black-water fever is chiefly the direct consequence of the use of quinine in malaria. Koch has contended that in black-water fever the malarial parasites are very often absent; that when they are present their number bears no relation to the hæmoglobinuria; that there are many cases of malaria with numerous parasites without the existence of hæmoglobinuria; that there is no direct clinical correspondence between the outbreak of malaria and that of the hæmoglobinuria, and that the black-water fever may appear with either the tertian or the more severe tropical forms of malaria.

Kleine[7] has made observations under Koch's direction of 15 additional cases of black-water fever. In every one of these cases the hæmoglobinuria followed the use of quinine. The exact explanation of why the black-water fever appears in these patients is not clear, though quinine appears to exert its toxic influence chiefly upon blood corpuscles that have been damaged by the preceding malaria. Kleine is authority for the statement that Koch is a firm believer in the prophylactic use of quinine in malarial districts as well as in its use during malaria, notwithstanding the occasional appearances of hæmoglobinuria. He, however, believes that for prophylactic purposes a sufficient dose of the drug should be given. That black-water fever may appear in other than tropical climates is believed by Otto,[1] who reports a case where the malaria with the hæmoglobinuria was apparently acquired in Poland. Tropical conditions are not, he believes, essential to the development of the black-water fever.

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[1] Centralblatt f. Bakt. Originale, June 3, 1902, I. xxxi.

[2] Medical Record, April 5, 1902.

[3] Journal of American Medical Association, August 4, 1900.

[4] Boston Medical and Surgical Journal, June 26, 1902.

[5] Medical Record, July 12, 1902.

[6] PROGRESSIVE MEDICINE, December, 1902, p. 368.

[7] Zeitschrift f. Hygiene, 1901, Band xxxviii. p. 472.

Blair,[2] from an experience on the west coast of Africa, adopts the idea that black-water fever is a malarial disease; that quinine is the immediate exciting cause of the intoxication. Protection from malaria will, he thinks, protect against the black-water fever.

Jollasse[3] reports a case of black-water fever in an adult who had suffered previously from malaria in Kamerun. Quinine given during convalescence from an attack of erysipelas was followed by chills, fever, bloody stools, and hæmoglobinuria. No plasmodia were found. A few weeks later, after a typical malarial attack, fifteen grains of quinine were administered, and again black-water fever appeared. This seems to show the influence of quinine in producing the black-water fever in one who has had tropical malaria.

Ruge[4] and Schlayer[5] also report on cases of black-water fever where quinine seemed to be the immediate exciting cause of the outbreak. Ruge calls attention to the value of examining the blood in cases where even a slight icterus or suspicious color of the urine give a hint of an approaching severe attack. If shadow corpuscles, macrocytes, or polychromatophilia are found, they should be looked upon as significant of approaching grave blood changes, and quinine discontinued. These observations on the morphological changes in the blood were made in 1895 by F. Plehn. It is to be hoped that the newer methods of blood examination will be employed in the case of black-water fever, and the hæmolytic power of the blood, tested with the effect of quinine upon the same. There is certainly an excellent field here for research.

Nephritis in Malaria. J. F. Moore,[6] in a study of malarial nephritis, reaches the following conclusions:

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[1] Deutsche med. Wochenschrift, January 23, 1902.

[2] St. Louis Courier of Medicine, January, 1902.

[3] Aerztlicher Verein in Hamburg, December 10, 1901. Report in Deutsche med. Wochenschrift, Vereins Beilage, February 6, 1902 p. 47.

[4] Deutsche med. Wochenschrift, July 10, 1902.

[5] Ibid.

[6] American Medicine, December 28, 1901.

1. Nephritis is not likely to occur in a single tertian infection of short duration.

2. A double tertian infection will produce nephritis in a large percentage of cases if it runs only for a short time. His percentage is 80 per cent., but he thinks this is too large.

3. The more chronic the case becomes of any infection, the more likely it is to produce nephritis.

4. Malaria of long duration or often repeated attacks will produce chronic renal disease, as shown by continuous presence of albumin and casts.

5. Æstivo-autumnal malaria probably gives the greatest percentage of cases of nephritis—68.7 per cent.

6. The age of the patient, height of temperature, or specific gravity of the urine, showed no relation to the presence of albumin or casts in his cases.

Skin Eruptions in Malaria.[1] Riesman[2] has investigated the subject of skin eruptions in malaria, reporting a case of urticaria. From his study of the subject he makes the following conclusions:

1. Skin eruptions are not rare in malarial infection.

2. Most frequent are herpes and urticaria.

3. Neither of these presents any specific character.

4. Both may occur in any stage of the malarial paroxysm, although urticaria is most frequent in the febrile and herpes in the sweating stage.

5. In obscure cases herpes and urticaria, especially the former, may have considerable diagnostic value.

6. Three types of urticaria are recognizable: that accompanying the paroxysm, usually the febrile stage; that taking the place of the chill, and that substituting the entire paroxysm.

7. In their appearances these three do not differ among themselves, nor from urticaria due to other causes.

8. In cases of urticaria of obscure etiology the blood should be examined for plasmodia; whether found or not, quinine is worthy of trial.

Malaria and Hemorrhagic Pancreatitis. Ross and Daniels[3] report a case of malaria in which during life there were no symptoms that led to the suspicion of this disease. It is noticeable, also, that pain was not present at any time. On post-mortem examination extensive hemorrhagic pancreatitis, with fat necrosis, was discovered. They believe that the cause for this was to be found in the numerous malarial organisms that were present in the vessels of the stomach and intestines as well as in the pancreas. These had damaged the organs to such an extent that invasion by other micro-organisms was possible, and to this secondary invasion they believed the hemorrhagic pancreatitis was due.

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[1] Progressive Medicine, December, 1902, p. 369.

[2] American Medicine, March 22, 1902.

[3] Journal of Tropical Medicine, February 22, 1902.

Acute Lymphæmia and Malaria. An unusual finding in cases of malaria was that of an increase in the leucocytes in a case of æstivo-autumnal fever reported by Brown.[1] This increase was largely in the mononuclear forms, 82 per cent. of the 40,000 white blood corpuscles being mononuclear. The blood findings were, therefore, those of an acute lymphæmia. There were extensive sclerotic changes in the kidneys, vessels, and heart, though no history of syphilis was obtainable. The man had, however, lived, some years before, in a malarial district, though he denied ever having had malaria. He was forty-five years of age at the time of death.

Malaria and Carcinoma. It will be remembered that the contention has been made by Loeffler[2] that carcinoma and malaria are in some mysterious way antagonistic to each other. The opposite of this view, however, is the experience of Prochnik,[3] who, while in Java, has had the opportunity of seeing very many persons with carcinoma, particularly carcinoma of the liver. As nearly all individuals in Java have or have had malaria, he believes that this is a proof that malaria does not tend to diminish the frequency of carcinoma ; in fact, his impression is that previous malaria rather predisposes to carcinoma.

Aschoff,[4] also, from a study of English colonial reports, while finding some apparent confirmation of Loeffler's view, reaches the conclusion that no such antagonism is proven.

And Goldschmidt[5] finds that on the Island of Madeira, while there is no malaria except what is imported, anopheles being absent, there is no great prevalence of carcinoma. If Loeffler's hypothesis were true he argues that patients with carcinoma should be numerous, whereas they are very few.

Latent Malaria may mask under the form of a non-febrile anæmia, a diarrhœa, dysentery, dyspepsia, etc. Craig[6] found many cases of masked malaria in nearly 200 soldiers returned from duty in the tropics. Most of these resembled chronic diarrhœa or dysentery. Fourteen had been diagnosed as pulmonary tuberculosis. The importance of recognizing a malaria that simulates another disease is self-evident, as is the value of detecting a malaria that complicates some other disease, as dysentery.

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[1] Boston Medical and Surgical Journal, March, 1902.

[2] Deutsche med. Wochenschrift, 1901, No. 42.

[3] Wiener klin. Wochenschrift, January 30, 1902.

[4] Deutsche med. Wochenschrift, June 12, 1902.

[5] Ibid., July 10, 1902.

[6] Medical Record, February 15, 1902.

Caccini[1] has made a thorough study of the subject of the latency of malaria in the case of the tertian and quartan fevers. His conclusions are here given verbatim:

"1. Malarial infection admits of relapses at short or long intervals. 2. In attacks at short intervals the period of latency approximately equals the period of incubation, and therefore: (*a*) In spring tertian it varies from one to eighteen days; (*b*) in malignant tertian it varies from five to eighteen days, but generally occurs between the fifth and ninth days; (*c*) in quartan, the duration of the period of latency is undetermined, for the latency ceases on the intervention of any of those conditions which we have seen to be the determining cause of relapse. 3. Quinine treatment influences the duration of the period of latency to the extent that, in patients who have followed it systematically, the latency reaches its maximum duration, and in these the number of attacks are fewer. 4. The quinine treatment has no influence to prevent attacks at long intervals. 5. Attacks at a long interval invariably presuppose the intervention of a determining factor. 6. In spring tertian the attack at a long interval has a period of latency varying, as far as I could ascertain, from three to thirteen months. 7. In quartan the attack at a long interval is not clearly differentiated from that at a short interval; both are influenced by the kind of relapse and the importance of the intervening accidental factor, therefore the latency does not cease until the appearance of the latter. 8. The attack at a long interval in summer malaria may be said to have a latency varying between two and eight months, always remembering that the maximum limit of eight months was only found by us in one case—that of a patient suffering from summer infection, with fever of a quotidian type. 9. The attack at a long interval is very frequent in spring tertian and rare in quartan (if only because of the difficulty with which the patient can escape some determining factor of relapse, seeing the special obstinacy of quartan infection and its peculiar liability to relapses). 10. Tertian spring and quartan infections are more tenacious and liable to relapses. The prognosis with regard to relapses is much more serious than in malignant tertian, though the symptoms of the latter are more serious and dangerous, the attacks recur readily at short intervals, but there is no relapse at a long interval, or it is most exceptional after two months' apyrexia."

The Influence of Light.[2] Some rather novel and striking views concerning the phenomena of malaria and the influence of quinine upon it are given by King.[1] He presents a number of facts to prove that the curative action of quinine in malaria may be brought about by its power to kill the parasite with *fluorescent light.*

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[1] Journal of Tropical Medicine; numbers from April 15 to June 16, 1902.

[2] PROGRESSIVE MEDICINE, December, 1902, p. 367.

Treatment of Malaria.[2] BIHYDROBROMATE OF QUININE IN MALARIA. The bihydrobromate of quinine is preferred by Ferguson,[3] who gives it hypodermically in doses of about three grains. Six doses of this size were sufficient to cure. Ferguson has tried it on 100 cases, and finds it non-irritating when given in solution hypodermically, and he believes it is ten times as effective as when given by the mouth.

SERUM TREATMENT. Kuhn[4] found, during a sojourn of five years in German Southwest Africa, that horses died of malaria, the parasite being found in their blood and the disease apparently transmitted by the mosquito. He claims not only to have protected horses against malaria by a serum the preparation of which he will later disclose, but to have cured horses after there were manifestations of the disease. More than this, he has cured cases in men. He regards the malaria occurring in man and the horse in this locality as identical. Should these observations be confirmed a rich field of investigation with wonderful practical results will be opened up.

PNEUMONIA.

Prevalence of Croupous Pneumonia. That pneumonia has been gradually increasing in frequency, that it is the same deadly disease as of old, and that treatment is too often futile, if not harmful, is the impression of most men of experience, at least in the hospitals and in our large cities. This is discouraging if not disgraceful. At the meeting of the American Medical Association, held at Saratoga, several papers on this subject were read, abstracts of some of which I give. The trend of these papers and of the discussion was far from encouraging. Yet good may come if members of the profession are aroused by the candid presentation of these facts, to renewed and closer observation of the clinical phenomena of the disease, to more careful and less harmful therapy, and to assisting in every effort at research, be it laboratory, experimental, clinical, or statistical that can throw additional light on the problem of how to avoid this dread disease that has lost much of its terror merely because it is seen and met so often that the public has become familiar with it. A visitation of cholera that was as deadly as pneumonia would call forth scare head-lines in even our soberest daily papers, and completely unnerve an entire country. I cannot refrain from quoting an editorial in the *Journal of the American Medical Association* anent this subject. The writer's name I do not know. The date of the journal is July 5, 1902.

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[1] American Journal of the Medical Sciences, February and June, 1902.

[2] PROGRESSIVE MEDICINE, December, 1902, pp. 363, 366.

[3] British Medical Journal, February 22, 1902.

[4] Abstract in Centralblatt f. Bakteriologie, August 12, 1902, I. xxxii.

"On the same afternoon of the Saratoga meeting two of the sections of the Association were occupied with the important question of the present-day mortality from pneumonia. In the Section on State Medicine the discussion brought out the fact that while the mortality from all the other infectious diseases has been very materially decreased, and they occur with ever-lessening frequency, while the general city death rate has been nearly halved in a quarter of a century and the average age at death of the population has increased from thirty-one to over thirty-five years, the mortality from pneumonia has increased almost in proportion to the density of the population of our cities. While tuberculosis has dropped to fourth place in the list of diseases causing death, pneumonia has advanced to second place in many large city mortality returns. In the section on the practice of medicine, on the other hand, the mortality from pneumonia at the present time was reported to be over 30 per cent. in large hospitals, and in extensive series of cases in private practice at least 18 per cent. Besides, it was confessed that our methods of treating pneumonia are not a whit more successful at the present time than they were seventy years ago, when pneumonia first began to be generally recognized as an independent disease.

"This is, of course, an appalling, almost, we might say, absolutely discouraging picture. As Dr. Osler well said, it is extremely hard to understand how physicians can sit mute and impassive while listening to the details of this sad state of affairs, yet, as he added, our only possible attitude must be that of impassivity, for our hands are tied as far as regards the possibility of ameliorating the situation. It may be said, it is true, that there are two factors which lessen somewhat the force of the statistics cited. Our improved city sanitation has, in recent years, kept alive many of the very young and the old who formerly perished from diseases incident to unhygienic surroundings, only to have many of them fall victims to pneumonia. The death rate from intestinal affections among infants in our large cities is much less than it was, and this keeps alive many delicate children who readily succumb to pneumonia before childhood is over. At the other end of life people are living distinctly longer than a generation ago. There are now nearly twice as many among our city populations who are over sixty years of age as there were half a century ago. Old tissues are an especially favorable soil for fatal pneumonia. An analysis, however, of the statistics of large cities,[1] as, for instance, those of the city of Chicago,[2] shows that the death rate from pneumonia has increased much more than has the percentage of persons living over sixty years of age. Even with the addition of the delicate children, saved from other fates to become victims of pneumonia, it would seem that this dread disease, in spite of all boasted sanitary and hygienic advance, is ever increasing its ravages, especially in our crowded centres of population.

"The great practical question is: What shall be done to modify this alarming situation, when growing prevalence and the failure of therapeutics make the future look so dark? Prophylaxis is the first thought, but its successful employment is a most complex problem. Dr. Cunningham, of Alabama, reported in the discussion on pneumonia a series of epidemics of the disease that had occurred during the last fifteen years among the 600 prisoners who are under his charge. Epidemics of pneumonia are not infrequent in unhygienic barracks in Europe, and, to a limited extent, in boarding schools and in hospital wards in this country. While the risk of contagion, then, must be considered, and scrupulous care of the sputum and of all the other excreta of pneumonia patients and the employment of careful precautions against allowing any of the material from becoming dry and finding its way into the air are advisable, it should be remembered that the germs alone are not perhaps the most important factors, except it may be in epidemics such as mentioned above. In densely populated cities the intimate association of human beings, as in ill-ventilated and unsanitary quarters, would naturally seem to provide the opportunity for their distribution. Many healthy persons have the pneumococcus almost constantly present in their mouths, but under special conditions of physical weakness the soil is prepared, and they become fulminantly virulent. Influenza is doubtless responsible for a portion of the increase of the disease during the past ten years. The increasing urban concentration may also play its part in predisposing to the disorder, and there may be other important factors as yet undiscovered. We know, however, that climatic conditions and exposure are active elements in the causation; it is in cold and changeable weather that it is most deadly, and that it is by no means so important a causal element in the mortality in the warmer portions of the country as it is in the rigorous climate of the North.

"It would seem that if the problem of pneumonia mortality—one of the most urgent that presents itself for the consideration of the twentieth century sanitarians—is approached from this standpoint of prophylaxis, some practical headway against the new 'captain of the men of death' may be made in our generation. Just now the duty of the medical profession is to familiarize the public with the dangers of pneumonia, instant and foreseen, so as to bring about a state of public opinion that will encourage the enactment and enforcement of any sanitary regulations that may check its apparent increase."

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[1] See editorial in the Journal, April 14, 1900.

[2] Monthly Bulletin, Department of Health, Chicago, May, 1901.

E. F. Wells[1] studies the statistics in regard to the increased prevalence of pneumonia and its increased mortality. After speaking of our imperfect knowledge of the pneumococcus outside of the body, he considers that it gains entrance to the respiratory passage either from pulverized secretions containing the organism or from a spray thrown off by infected patients.

As to the question of the increasing fatality of pneumonia, he is not prepared to say. Careful consideration of the tables he has prepared leads him to believe that the death rate has been the same for the past ten years. But while the death rate of pneumonia may remain the same, he affirms that the death rate of pneumonia in proportion to the population and deaths from other causes has increased considerably during the past century. If this is true the conclusion is irresistible that the prevalence of pneumonia has greatly increased.

Considering the causes of this increase, he shows that it cannot be due to any deterioration of the resisting powers of the individual, because the average duration of life has increased.

It is difficult to believe that it is due to any increased vulnerability of the individual to this malady. He concludes that it is due to an increased prevalence of the pneumococcus or that opportunities for encountering this germ have been multiplied, or both. The increased urban population and the increased facilities for travel would seem to bring this about. He also believes that a weakening of the respiratory reflexes during sleep, which follow chilling of the surface of an exhausted body, may be a contributing cause. His conclusions are:

1. The fatality of pneumonia has increased but little during the past eighty years.

2. The prevalence has increased greatly, especially during the past twenty years.

3. The air passages should be kept as clean of mucus as possible. When the pneumococci have been demonstrated in the secretions the care should be especially well directed. The sputum containing pneumococci should be destroyed carefully. Persons so affected should cough or sneeze into a moistened cloth.

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[1] Journal of American Medical Association, November 15, 1902.

4. For communal prophylaxis the above instructions should be kept before physicians, and they in turn should urge them upon their patients.

5. As the fundamental information on which prophylactic rules may be formulated is not yet at hand, it should be the duty of health officers to search for such information, and as a preliminary step pneumonia should be placed upon the list of notifiable disease, and the environment of pneumonia patients carefully noted and analyzed.

James J. Walsh[1] states that pneumonia is on the increase, and that the mortality is also distinctly on the increase. He, however, gives no statistics to prove this. He says the mortality cannot be accounted for by the fact that there are more people living now over sixty who are especially liable to pneumonia, nor by the fact that many weak children now survive who formerly died. He speaks of the contagiousness of pneumonia, which, while denied by many, yet is shown by the fact that it often occurs in epidemics, and one case has been followed by many others in schools, prisons, hospitals, etc. He urges that the public should be instructed in this danger, and special care be given to the care of the sputum.

Such directions may seem exaggerated to many, but he calls attention to the fact that the suggestions as to the care of tuberculous sputum were laughed at twenty years ago. He believes that the pneumococci may live and possibly grow in the dust of the streets, and urges clean streets as a prophylactic measure. He also believes that public buildings, as theatres, churches, etc., especially where there are thick upholstery and little sunlight, may form the lodgement of the pneumococci. People going into such places from the cold have their respiratory passages in susceptible condition for the growth of the germs, and on leaving the building into the cold air again, the disease is favored. He suggests that in these buildings heavy draperies be done away with, and that provision be made for sunlight at least part of the day. He considers that defective sewers and leaking of illuminating gas may so irritate the mucous membrane as to make it especially favorable to the growth of the pneumococci.

Pneumococcus Septicæmia. R. I. Cole[2] studied the blood of 30 cases of pneumonia with reference to finding the pneumococci. All were cases of lobar pneumonia except 1, which was a pneumococcus septicæmia, arthritis, and meningitis, with a fresh patch of bronchopneumonia found at the autopsy, which was evidently secondary.

The cases were chosen at random among 63 cases, but as the mortality rate was 43 per cent. the cases were of more than average severity.

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[1] Journal of American Medical Association, November 15, 1902.

[2] Johns Hopkins Hospital Bulletin, June, 1902.

As to method, eight to ten cubic centimetres of blood were taken. At first bouillon was employed, but later litmus milk in flasks, each flask containing 150 c.c. of sterile litmus milk. In all cases the identity of the organisms was carefully established. The following results were obtained: Pneumococci were found in 9 of the cases—30 per cent.—all of which ended fatally. In 2 of the cases pneumococci were found free in the blood three days before death. In the other cases the cultures were made a shorter time before death. In 1 of the cases the cultures were negative six days before death, but were found three days later.

Thirteen of the 30 cases died, so the pneumococci were not found in 4 of the fatal cases, although several cultures were made.

The results are not of much value in diagnosis save perhaps in central pneumonia without physical signs, or in a general septicæmia; but they are of some value in making the prognosis, none of Cole's positive cases recovering. He then calls attention to the conflicting results which have been obtained in times past concerning the presence of pneumococci in the blood. This is due to lack of training, difficulty of preventing contamination, and to the employment of faulty media.

The author then reviews some of the work which had been done. Sittman, in 1894, found organisms six times in 16 cases; only 4 of these were positive in cultures. Of the 4 positive cases 3 died. Kunan, in 1897, in 9 cases, found the organism in only 1 out of 3 fatal cases. Kohn, in the same year, studied 32 cases, and found the cocci in 7 out of 12 fatal cases, and in 2 cases which recovered. In 1898 Sello reported 48 cases studied, the pneumococci being found in 12. Of the positive cases all but 2 died. In 1899 White made cultures of 19 cases, 10 of which were fatal, and in these fatal cases the pneumococci were found 3 times. In 1900 Silvestrini and Sertoli reported finding the pneumococci in 15 out of 16 cases examined. Within the past year Proshaska reported a series of cultures in which the pneumococci were present in each case, but Cole is inclined to doubt the accuracy of these results.

Pneumococcus Arthritis. In the *American Journal of the Medical Sciences* for July, 1902, I reviewed this entire subject, collecting all the cases in the literature, and in addition reporting cases of my own. A full discussion of the subject is given by Bloodgood in PROGRESSIVE MEDICINE, December, 1902, p. 131.

There is an additional paper on the same subject by Pfisterer,[1] of Basel, who discusses the subject of pneumococcus arthritis as seen in children.

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[1] Jahrbuch f. Kinderheilkunde, April 5, 1902.

Treatment.[1] It is interesting and, I trust, instructive to read of the treatment of pneumonia as employed by different men. Yet, after reading these articles one is more than ever impressed with the sad lack of anything that can be called a specific for pneumonia, and of any line of treatment that is by general consent regarded as rational. The amount of punishment the human body will stand even when it is ill is marvellous.

H. R. Tuthill[2] discusses the prophylaxis in pneumonia. After discussing the effect of the toxins in producing the constitutional symptoms of the disease, he states that something can be attempted to abort the disease in its first stage. He thinks such drugs as aconite are useless, if not positively harmful. He has had good results with the *carbonate of creosote* in the early stages, and believes it has certainly cut short the disease and prevented consolidation. *Salol* in 10-grain doses every two hours, given at the earliest possible moment, has been of great service to him. He cites 4 cases in which he believes he has aborted the disease by its use.

E. F. Ingals[3] discusses the prognosis and treatment of croupous pneumonia, and analyzes 338 cases which were treated in the Cook County Hospital, Chicago, in fifteen months ending April 1, 1902. The mortality was 36 per cent. The prognosis is influenced by the condition of the pulse, temperature, and respiration. Those given to excessive alcoholism have a poor chance for recovery, though death in many of these cases seemed to be averted by free stimulation. Nearly all those suffering from nephritis died. In discussing the treatment, he advises that the diet should be liquid, but nutritious, not given too frequently. Laxatives may be given at the outset, but later he believes they do actual harm. Heat or cold applied to the chest is often beneficial in preventing a spread of the disease. Poultices get cold quickly, and are annoying to the patient, but the cotton jacket is helpful. Counter-irritation is of no value at the height of the disease, but may be successful at the outset. Heart sedatives may be given during the first twenty-four hours, and may do good, but not later in the disease.

He has gotten some benefit from the use of ergot during the first twenty-four hours. Bleeding is very beneficial when there is undoubted plethora, with great dyspnœa and congestion. Pain is to be relieved by the application of heat or cold, or by cupping, while the coal-tar products, as a rule, are to be avoided. Opiates are to be used only as a last resort and when the pain is so severe that it must be relieved. Cough is often relieved by bromide of ammonium in combination with hyoscyamus. If opiates must be used for this, codeine is the best. For insomnia, if the bromide of ammonium does not relieve, sulphonal, trional, or chloralamid can be used. Temperature can be reduced by baths or sponging, or guaiacol, in quantities of 20 to 30 minims, can be rubbed into the skin. Alkaline diuretics also may aid in keeping down the temperature. There is no specific for pneumonia, but the remarkable results claimed for creosote, carbolic acid, and the salicylates would seem to indicate that they had some action. He quotes Robert Seigel,[1] who reported 72 consecutive cases treated with salicylate of sodium alone, with no deaths, and quotes other reports almost as favorable. The author refers to the use of creosote and carbolic acid, and suggests that if these can be used with favorable results guaiacol should be tried carefully in large doses. According to A. H. Smith and others, inhalations of chloroform have had a markedly good effect. Of the heart tonics he believes nux vomica or strychnine the best. Digitalis is to be avoided in spite of some favorable reports. In cases of profound toxæmia good may follow the administration by hypodermoclysis or high rectal enemas, of normal salt solution, with a small quantity of a calcium salt added. Ringer's solution may be used. It consists of a 1 per cent. solution of calcium chloride, 3 parts; a 1 per cent. solution of potassium chloride, 4 parts; 1 per cent. solution of sodium chloride, 20 parts, and distilled water, 23 parts. In severe cases alcoholic stimulants are very beneficial. The effect should be watched. The results of serum treatment so far have been negative.

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[1] PROGRESSIVE MEDICINE, December, 1902, pp. 340, 380.

[2] Medical Record, May 17, 1902.

[3] Journal of American Medical Association, November 22, 1902.

During convalescence the patient should be careful to avoid exposure or cold, as a recurrence is very liable within six months.

Cases of delayed resolution need chloride of calcium, iodide of ammonium, alkaline diuretics, and ferruginous tonics.

R. W. Wilcox[2] gives the mortality as roughly 25 per cent. Death more commonly takes place from gradual toxæmia or mechanical interference with the circulation or respiration. Another factor is the depressing effect of a great loss of blood serum if an extensive territory has been invaded by the disease. The dangers from the heart have always received attention at the hands of clinicians, and digitalis and other remedies have entered into most schemes for treatment. For many years Wilcox has been impressed by the beneficial effect of the nitrites in conjunction with strychnine, as advocated by Smith. The use of nitroglycerin or sodium nitrite in connection with strychnine has been very serviceable in his hands by, as he expresses it, bleeding the patient into his systemic arterial system. The loudness of the pulmonic second sound is an indication for their use. Lately he has used erythrol tetranitrate in doses of one-half grain every four or six hours. This has had more controllable and permanent effects than nitroglycerin. Strychnine he uses as the nitrate hypodermically, every four to six hours, in doses of one-sixtieth to one-fifteenth grain until the pulse is satisfactory. Alcohol is given only to alcoholic subjects, and then freely. Ammonium carbonate, in 10-grain doses in 2 ounces of milk every two hours, replaces strychnine in the aged. These remedies, employed with persistence and discretion, meet most satisfactorily the mechanical conditions. Veratrum viride in the early stages of young, robust patients has been followed by brilliant results. However, it is too depressing for routine use, and the same may be said of bleeding. Bleeding does not give as good results in pneumonia as in cyanosis from a dilated right heart due to other causes. He questions how much the blood pressure in the pulmonary artery is raised by extensive pulmonary consolidation.

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[1] Wiener med. Wochenschrift, May 7, 1898.

[2] American Journal of the Medical Sciences, September, 1902.

Wilcox then speaks of toxæmia, calling attention to the fact that death often results from very small areas of consolidation—too small to cause the fatal issue. Here toxæmia must be the efficient cause, and both prognosis and treatment must be influenced by our knowledge and appreciation of it. As late as 1897 Osler believed we had no reliable measures at hand to combat toxæmia. Within two years Cassoute and Corgier reported, after continuous administration of fairly large doses of creosote carbonate, in most cases a typical fall of temperature during the first twenty-four hours, and, if the remedy were continued for a sufficiently long time, the apyrexia became permanent. The dose is from 2 to 4 drachms a day, the dose interval being six hours. Soon after the temperature reaches normal the amount is reduced one-half, and continued as long as the auscultatory signs persist.

Stokes has reported on 7 favorable cases; Bridges, 8; Frieser, 9; Meitner, 4; Van Zandt, 16; Von Ruck, 20; Weber, 9, and Thompson, 18.

The statement of Van Zandt is that creosote carbonate aborts a large percentage, mitigates almost all the rest, and in a small percentage there is no result.

The author's cases number 33, with no deaths. The disease terminated by lysis in 9, by crisis in 24. Crisis occurred on the sixth day in 1, seventh in 2, eighth in 9, ninth in 6, tenth in 3, and eleventh in 2, and twelfth in 1.

Aside from the remarkable reduction of mortality the increased number of cases in which crisis occurred is suggestive as to the true significance of that phenomenon, and is an argument for the value of the remedy in nullifying the bacterial activity and its results.

Of the accessory treatment, in addition to that with reference to the mechanical conditions, attention should be paid to emunctories. In patients suffering from interstitial nephritis, intestinal irrigations of a gallon of the decinormal saline infusion at a temperature of 108° F. practised twice a day are valuable for provoking diuresis, stimulating the heart, and, to a less extent, producing diaphoresis. The bowels may be kept open with small doses of calomel and saline purgatives until the stools become odorless. This has been of frequent use and marked benefit. Oxygen is of value if the respiratory surface is decreased. No harm results from its use. In the author's earlier practice cold applications to the surface were employed, but have been abandoned of late. As to diet, milk is chiefly employed. He summarizes as follows:

1. Continuous, persistent, and generous administration of creosote carbonate.
2. Careful adjustment of mechanical conditions.
3. Thorough evacuation of toxins by all possible ways.
4. Temporary supplemental oxygen by inhalation.
5. Liquid diet until physical signs disappear.

To be avoided are opiates, antipyretics, ill-advised external applications, and slowly acting heart remedies, as digitalis.

N. S. Davis, Jr.,[1] states that in Chicago he finds that in 1852 the deaths from pneumonia were 1.66 per cent. of deaths from all causes. In 1862 they constituted 3.40 per cent.; in 1882, 6.22 per cent.; in 1892, 9.14 per cent.; in 1902, approximately 12 per cent. He says Chicago is not peculiar in this, as pneumonia has been increasing everywhere.

After discussing the history of *venesection* as a form of treatment, he says that bloodletting can often be resorted to with benefit, but does not shorten the disease or influence the vitality of the germs. It is most useful to unload a dilated right heart. *Veratrum viride* and *tartar emetic* are to be avoided. Calomel may be employed early as a laxative, but has no further beneficial effect. To-day the protective or defensive treatment recognizes that the patient's life is endangered (1) by toxins produced by the micro-organisms; (2) by rapid involvement of large areas of lung tissue which makes them functionally useless; (3) by sudden distention of the right ventricle to the point of paralysis by obstruction to the pulmonary circulation; (4) by œdema of the lungs the result of a weak heart, enfeebled respiration, and probably by toxins.

As yet no specific has been found. As a general rule, the evidences of pneumonic intoxication are in proportion to the area involved, but not always. Elimination is important. We do not as yet know whether the toxins escape by other channels than by the kidneys, still free evacuations of the bowels contribute to the comfort and well-being of the patient. Digestion is slow and imperfect, consequently food should be that which is most easily digested. Milk, broths, gruels, and fruits, such as oranges, may be taken. When the urine is small in amount, and there is evidence of deep intoxication, large subcutaneous injections of physiological salt solution often do good by stimulating diuresis and more rapid elimination of the toxins. Elimination by the skin should be encouraged by sponging with tepid water.

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[1] Journal of American Medical Association, July 5, 1902.

Cyanosis may be due to hepatization of large areas of lung tissue, to enfeebled pulmonary circulation, to toxæmia or œdema of the lungs. By maintaining the heart's strength and vigorous breathing the condition will be relieved and arrested. The distress which accompanies it can be greatly relieved by the use of oxygen. It is rare that it saves life, but life may be prolonged by its use.

Great attention has been given to the heart. This is very important. The obstruction to the pulmonary circulation develops so rapidly that the right heart is often dilated and weakened. Other factors play a part in the weakening of the heart. The disturbed metabolism of the heart muscle and the insufficient supply of oxygen are among these factors. Digitalis is greatly relied upon to combat this weakness, but caffeine, strophanthus, and cactus may be used in its stead. Digitalis should not be used when the pulse rate is less than 100 per minute. It may be prescribed in larger doses than common, for in pneumonia there is a peculiar resistance. Strychnine is especially valuable.

Of the diffusible stimulants, the aromatic spirits of ammonia and the carbonate of ammonium are the best. They are useful expectorants, and are prompt and efficient in their action. The author discourages the use of alcohol as a heart tonic; the best effects are obtained in small doses, but its effect is very transitory, lasting only about fifteen minutes. After trials of it, and much experience in the treatment without it, he is convinced that patients do best without its use. It lessens the oxygen-carrying power of the blood, disturbs metabolism, dilates peripheral arterioles, and lessens diuresis.

Antipyretics are to be avoided as dangerous. Cold baths have been used, but they do not lessen the mortality, and do no harm. Pain, coughing, and weariness can be relieved by opiates in mild cases, but in severe cases they lessen the depth of the respirations and increase the cyanosis. They suppress the coughing and lead to the accumulation of mucus as well as lessen the elimination by the kidneys.

The antipneumonic serums are of no value.

In regard to prophylaxis, care should be taken in the disposal of the sputum. Soiling of the bed-clothes with it should be avoided as far as possible. During convalescence for at least two weeks the sputum should be disinfected, and the patient use antiseptic mouth washes. After the sickness the room should be carefully cleaned and ventilated.

Complications and Sequelæ of Pneumonia. An exhaustive paper on this subject has been published in the *Medical News* for August 23–30, 1902, by Hare and Dare.

ACUTE RHEUMATISM.[1]

Etiology and Bacteriology. In last year's volume[2] there was noticed the work of Fritz Meyer on the bacteriology of rheumatism. In the *Zeitschrift für klinische Medicin*[3] he writes more fully upon the subject and in the light of more extended experimental investigations. The diplostreptococcus described in the abstract of last year is, he believes, the cause of rheumatism, and probably identical with the organisms found by others—Goldscheider, Michaelis, Litten, Wassermann, Triboulet, Coyon, Apert, Poynton and Payne. This organism differs from the ordinary streptococcus or staphylococcus in seeming to possess a pathogenicity of its own as well as in certain cultural and tinctorial peculiarities already referred to. Unlike the pneumococcus, it requires unusually large doses of it to produce early death in animals. Nor is there any increase in virulence by the passage of the organism through animals, at least through rabbits. Intravenous injections have lately been employed by Meyer instead of the subcutaneous.

In from six to eight days after the injection, in many cases pain and swelling were noted in a joint, oftenest the knee or the shoulder. Without the formation of pus the swelling subsided, to be followed by the similar involvement of another joint. The inflamed joint was found to be the seat of a synovitis, with serous or serofibrinous exudate, in which, as in tuberculous exudates, the mononuclear cells were a prominent feature. If examined early the micro-organism could be isolated from the joint; if late, the results were negative, thus presenting a striking resemblance to the findings in human rheumatic arthritis. Joints examined after the arthritis had disappeared were found macroscopically and microscopically normal, complete *restitutio ad integrum* having taken place.

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[1] PROGRESSIVE MEDICINE, December, 1902, pp. 25, 137.

[2] Deutsche med. Wochenschrift, February 7, 1901.

[3] Zeitschrift f. klin. Medicin, Band lxvi., p. 311.

In some cases (21 in 100 animals) *verrucose endocarditis* was present, the warty outgrowths on the valves often producing enough mechanical interference with circulation to be the immediate cause of death. Superficially the excrescences showed no bacteria; deeper in they were found. No necrotic changes, such as are common in experimental streptococcus endocarditis, were seen. On the contrary, evidence of repair was often evident.

Meyer, in his critical survey of the subject, calls attention to the striking differences between the animal experiments with his organism and those with ordinary pyogenic microbes—*e. g.*, staphylococci—even though the latter are attenuated. With the latter the arthritis is often monarticular, permanent, the fluid is purulent, and is rich in the offending micro-organisms; and there is greater tendency to destruction of the cartilage and surrounding tissue; in short, the process does not resemble rheumatism in man as does the experimental arthritis with the diplostreptococcus of Meyer.

The special affinity for the joint, of this streptococcus of rheumatism, is shown by experiments made by Meyer as follows: Injecting into animals large doses of staphylococci and streptococci in bouillon culture, not only were these organisms found in the pus-containing joints, but in the heart's blood as well. With the special streptococcus of rheumatism the germs were found only in the joints, having disappeared from the blood. Mixtures of staphylococci and Meyer's streptococcus resulted in staphylococci in the blood, the special streptococcus in the joints. This diplostreptococcus, then, seems to have a predilection for the joints.

That this organism is probably the etiological factor in acute rheumatism seems highly probable from the fact that Meyer, in 100 animals, produced vegetative endocarditis in 20 by the intravenous injection of the microbe where there was presumably no previous lesion of the valves. In 100 control animals, other organisms being employed, endocarditis was found in but 2. The lesions produced by Meyer's organism resembled those of human rheumatic endocarditis in the absence of a destructive process and in the tendency toward the healing. The valvular localization Meyer regards as an evidence of a special affinity of his organism for the valves, and not due to pure accident.

In 3 cases out of 100 peculiar involuntary muscular movements, particularly of the neck, were seen, not unlike those of chorea.

As the result of the work outlined in this article and in others already published, Meyer believes that in the organism that he has described, and which is found in the angina of rheumatism as well as in the arthritis, endocarditis, and pleuritis of the same disease, we have the cause of the disease. The organism he regards not as a modified pyogenic microbe, but a streptococcus of a special sort.

An extended notice of the work of Poynton and Payne[1] is found in PROGRESSIVE MEDICINE for March, 1901. The same authors[2] make a further report of their investigations that confirm their earlier work. In this résumé they state that the diplococcus described by them has been found in 29 cases of rheumatism. The similarity to the organism described by Meyer is referred to by them. Also, one must notice that in most points their work and the work carried on independently by Meyer are along the same lines, and arrive at very nearly identical results. The organism of Poynton and Payne they regard as the cause of acute articular rheumatism as well as of the endocarditis, pericarditis, pleuritis, and chorea that so often accompany it. Rheumatism, they think, is not an infection with a weak streptococcus, but a definite disease produced by this special micro-organism.

In a review of the subject of acute and chronic rheumatism, Predtetschensky[3] expresses the opinion that as certain forms of arthritis, such as the gonorrhœal, pneumococcic, etc., have been proven to be due to particular organisms, and hence are to be excluded from the category of true rheumatism, so in the future other forms may be identified, one, perhaps, due to the streptococcus, another to the staphylococcus, still another to Achalme's bacillus, etc. Color is lent to his supposition, he thinks, not only because of the varying bacteriological findings in different cases at the hands of many observers, but also because of the varying clinical pictures in different cases, in the one an angina, in the other none; in one prompt response to salicylic acid, in the other a stubborn refusal to yield to any medication; in the one great tendency to involvement of endocardium, pericardium, pleura, in the other no such tendency. He urges, therefore, a more careful clinical observation of cases in the hope that definite clinical features may be found associated with a definite organism. He, himself, in 5 cases has failed to find Achalme's organism in the blood. In 2 of the 5 cases he found a streptococcus resembling the streptococcus of Wassermann and Meyer, even to the production in rabbits and guinea-pigs of arthritis, endocarditis, etc. He forbears, however, to express any positive opinion as to whether this streptococcus is a coccus *sui generis* or only a modified, weak, ordinary streptococcus. He thinks, possibly, the latter view may be proven the correct one, and calls to mind the experience of

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[1] Lancet, September 22, 1900.

[2] Centralblatt f. Bakteriologie, Abtheilung I., 1902, xxxi. p. 502, Originale.

[3] Centralblatt f. die Grenzgebiete der Medicin und Chirurgie, September 6, 1902, Band v., No. 17.

Bezançon and Griffon,[1] who found arthritis more apt to appear when weak cultures of the pneumococcus were injected into an animal or when a virulent culture was injected into an animal previously rendered relatively refractory by vaccination against the pneumococcus.

Thue[2] is a believer in the specificity of rheumatism, though he does not regard the organisms yet described as the cause of the disease as the true ones. No complete identification of the causative agent has yet been made. He makes a sharp distinction between pyæmic manifestations and those of true rheumatism, though recognizing that the two conditions may closely resemble one another or may even coexist.

Menzer[3] speaks cautiously regarding the conclusions to be drawn from finding streptococci in the throat of rheumatics. He himself has obtained streptococci from the tonsils, has injected them into the veins of rabbits, and produced swellings of the joints, pleuritis, ascites, and fibrinous deposits on the valves of the heart. But the frequency with which streptococci are found on the tonsils, the varying biological and cultural characteristics of the organisms he has found lead him to ask for more proof of the direct relation of this microbe to rheumatism, and especially of its specific character. That the tonsils afford a ready portal of entry to the general circulation is shown by his finding in several cases diplococci and streptococci in the bloodvessels of the peritonsillar tissues. This point he emphasizes in another article,[4] where he expresses the belief that not only in rheumatism, but in endocarditis, perhaps pneumonia, and many other infectious diseases, the avenue of entrance is the tonsil, local or constitutional conditions weakening its defensive power and enabling the micro-organisms present in the nose and pharynx to gain entrance to the general circulation. Much importance should be attached to the influence of cold, trauma, age, hereditary predisposition, and the general condition of the patient as determining the occurrence of infectious diseases. These factors are of as great moment as the micro-organism, which cannot develop except under favorable circumstances and lessened resisting power on the part of the individual. Menzer, in a case of *erythema nodosum*, has found a staphylococcus albus. He regarded the throat, in this case, as the primary source of infection.

Lande[5] argues that rheumatism is probably due to weak streptococci or their toxins. He is led to this conclusion largely because on the fifth day of an erysipelas—a streptococcus disease—a patient of his suffered an attack of typical acute articular rheumatism. No bacteriological data are given.

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[1] Arch. de méd. Expérim., 1899, p. 705.

[2] Norsk Magazin for Laegevidenskaben, 1902, No. 2.

[3] Deutsche med. Wochenschrift, 1901, No. 7.

[4] Berliner klin. Wochenschrift, 1902, Nos. 1 and 2.

[5] Gazeta lekarska, 1900, No. 14. Abstract in Centralblatt f. Bakt., 1902, xxxi., Abtheilung I., Referate p. 110.

Contagiousness of Rheumatism. Kollmann[1] reports the case of a mother, aged fifty-four years, who was taken with acute rheumatism while caring for her son, who had suffered for over four weeks from a typical attack of the same disease. He cites a few other cases from the literature that lend some color to the theory of contact infection or of direct conveyance of rheumatism from one person to another. The possibility of hereditary influences and of similar hygienic surroundings are discussed; but the whole question has to be left open, with these few cases suggesting a line of careful clinical and experimental observation.

Tuberculous Pseudorheumatism. In the course of pulmonary tuberculosis, Poncet[2] saw in 3 cases swellings of joints rather suddenly appear. From their resemblance to rheumatism, he speaks of the occurrence as tuberculous rheumatism or pseudorheumatism of bacillary origin. That the process was a true tuberculous synovitis, at least in 2 cases, was shown by inoculation of guinea-pigs and the development of tuberculosis. The use, therefore, of the term rheumatism in connection with such an arthritis is not to be commended.

Patel[3] shows that the so-called tuberculous rheumatism is in reality tuberculosis. From simple arthralgias due to attenuated tuberculous organisms or to their toxins, to the ordinary white swelling, there are all varieties of joint involvements, in reality tuberculous and not rheumatic.

Poncet,[4] in a more extended article under the title "Tuberculous Abarticular Rheumatism," contends that in the case of infection with the tubercle bacillus as with other germs, an infectious rheumatism ought, according to the law holding true for all infectious diseases, to make its appearance. These tuberculous lesions are of a special nature and of lessened malignity. He believes toxins without bacilli may produce these arthritides. He has seen following the injection of tuberculin painful swelling of the joints, the signs of inflammation gradually disappearing. He cites an instructive case of Lannelongue's of a similar nature.

Among the abarticular localizations of tuberculous pseudorheumatism he includes endocarditis, pleuritis, neuritis, together with various affections of the alimentary and genito-urinary tracts, etc. In some of these lesions the anatomical evidence of tuberculosis may be lacking, yet animal experiments may show the tuberculous nature of the trouble. This was shown in one of his cases of pulmonary tuberculosis, with multiple arthritides of rheumatic appearance, in which the vegetations from the mitral and aortic valves produced tuberculosis when injected into guinea-pigs.

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[1] Münchener med. Wochenschrift, July 1, 1902.

[2] Gazette hebdomadaire de Médecine et de Chirurgie, July 15, 1901; also, Gazette des Hôpitaux, 1901, No. 85.

[3] Revue de Chirurgie, December, 1901.

[4] Bulletin de l'Académie de Médecine, July 15, 1902.

Cases diagnosed as tuberculous meningitis, but which recover, are usually regarded as mistakes in diagnosis. Some of these cases, Poncet believes, are meningeal localizations of this pseudorheumatism; they are instances of attenuated meningeal tuberculosis. They may show recovery as well as when the tissue involved is the peritoneum, where recovery even from coarse, naked-eye tuberculosis is an admitted possibility. In a similar way the cord and peripheral nerves may show signs of this abarticular pseudorheumatism. In the skin, too, localized œdemas, nodes, erythemas, etc., may be due to the same cause. Poncet describes a man who had pulmonary tuberculosis with involvement of several joints, who presented an œdema of the face and later node-like subcutaneous swellings on the arms.

The frequency of these abarticular forms is shown by Trebeneau, in a Lyons Thesis (1901). He found in 100 cases of medical tuberculosis, chiefly pulmonary, 11 arthralgias, 5 acute or subacute articular rheumatisms, and 1 chronic. In 100 surgical tuberculoses there were 9 arthralgias, 7 acute or subacute, and 1 of the deforming variety.

Poncet draws the following conclusions:

1. There exists a tuberculous abarticular rheumatism as well as a tuberculous articular rheumatism.

2. Both belong to the class of infectious rheumatisms or pseudorheumatisms.

3. The abarticular manifestation of rheumatism, the cardiopathies, meningopathies, dermatoses, neuralgias, polyneuritides, etc., offer among other characteristics the following:

(*a*) Of occurring in the course of tuberculous articular rheumatism, but also without the arthropathy.

(*b*) Of presenting often the attenuated rheumatic forms of tuberculosis characterized clinically by their shifting character, their lessened gravity, and by their easier curability.

(*c*) Of causing in the organ affected lesions, varying from simple "fluxion" to incurable sclerosis. These lesions have generally nothing that is in the anatomical sense tuberculosis. They do not differ in their inflammatory or reactional changes from changes produced by other infectious diseases.

(*d*) In being due either to the bacillus of Koch (*tuberculides bacillaires*), or to its toxins (*toxi-tuberculides*).

As said before, one may question the justice of the application of the term rheumatism, to which a specific significance attaches or should attach, to these joint and visceral changes that merely resemble rheumatism in some clinical features, but which are admittedly due to the tubercle bacillus or its toxin. If a non-etiological term, such as tuberculous arthritis, is not desirable, if it seems wise to represent the clinical feature in the name employed, the term pseudorheumatism is far preferable to rheumatism.

The occasional resemblance of acute tuberculous arthritis to acute rheumatic polyarthritis is commented upon by Walter Stern,[1] who, in discussing the differential diagnosis of rheumatism, mentions the tuberculous joint as a possible source of error. He cites two illustrative cases where the early diagnosis had been rheumatism.

"Puerperal Rheumatism." Singer[2] reports on 6 cases of what he regards as rheumatic arthritis, or endocarditis developing during the puerperium. This "puerperal rheumatism" is similar in its clinical aspects to ordinary rheumatism, and may, according to Singer, be due to various organisms, as the gonococcus, streptococcus, staphylococcus, that, lying latent in the vagina, uterus, or adnexa, are aroused to activity by the process of parturition. The same criticism can be made upon this use of the term rheumatism that has just been made to the use of the expression tuberculous rheumatism. While, perhaps, pardonable in one who, like Singer, does not believe in the unity of rheumatism, it grates on the ear of those who look upon rheumatism as a specific infection, and in no sense do such terms serve to clarify our knowledge.

Rheumatism in Infancy. Barcus[3] describes a case of multiple arthritis in an infant of twenty-seven days. In the fugitive character of the joint swellings, the temperature, the absence of visible foci of suppuration, and in its recovery under salicylates and alkalies, it resembled acute articular rheumatism, and as such was regarded by the physicians in attendance. When the mother was five months pregnant she had what was called muscular rheumatism of the postcervical muscles.

Rheumatism as a Cause of Epistaxis in Children. Sidney Phillips[4] believes that the blood state induced by rheumatism may be the cause of epistaxis, at least in children. He reports 10 cases to prove his point. In all these cases no local nasal cause for the hemorrhage could be found, nor was the urine albuminous. In all there was evidence of previous or present rheumatism. In several of the cases an effusion into a joint was found, though little or no complaint of pain was made. Phillips recalls the fact that synovial effusion into the joints in the articular rheumatism of children is often painless. Salicylates had not been given to these children before the hemorrhages, thus ruling out the possible element of toxicity from an overdose of this drug, an occasional cause of epistaxis. In cases, therefore, of otherwise unexplained epistaxis in children Phillips advises careful search for evidences of rheumatism, such search to include an examination for sore-throat, joint effusions, chorea, and endocardial lesions, as well as for the more common manifestations of acute rheumatic polyarthritis.

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[1] New York Medical Journal, July 5, 1902.

[2] Wiener klin. Rundschau, 1902, No. 6.

[3] Archives of Pediatrics, January, 1902.

[4] Lancet, February 22, 1902.

Coincidence of Rheumatism and Typhoid Fever. P. K. Pel[1] describes in detail a case of acute rheumatic polyarthritis where, as convalescence was established, symptoms of typhoid fever made their appearance. The prodromes, temperature, relatively slow pulse, spleen, roseola, diazo reaction, and apathy made Pel sure the disease was typhoid, even though the Widal reaction was not present. He further believes the source of infection was an unusually virulent case of typhoid fever in the bed next to the rheumatic patient. With the typhoid there was a recurrence of the joint symptoms of rheumatism. Pel comments upon the rarity of the coincidence of these two diseases, upon the ease with which arthritides complicating typhoid can wrongly be called true rheumatism as well as upon the fact that severe rheumatism may resemble typhoid fever. The possible influence of the rheumatic infection in causing the Widal reaction to be negative is also discussed. An acute or recurring acute rheumatic endocarditis as the possible explanation of the typhoid symptoms was carefully considered, but repeatedly excluded.

Venous Thrombosis in Rheumatism. Venous thrombosis is a relatively rare complication of rheumatism. When it does occur it commonly affects the veins of the lower extremities. The report of 2 cases by Hess[2] from Fürbinger's wards is, therefore, worthy of notice, and particularly as the veins involved were somewhat exceptional. The first case concerned a man, aged thirty-two years, with swelling of the joints, an aortic murmur, and pleurisy. The temperature was not high. On the eighth day evidence of venous thrombosis was seen in a swelling of the arms, and later, with abdominal pain, in swelling of the lower extremities, and in ascites. Though seemingly fatally ill, the man made a good recovery. Hess believes that not only were the veins of the upper extremities thrombosed, but the inferior cava and the common iliacs as well. The veins in the axillæ were felt as hard, tender cords.

His second case was in a man, aged twenty-five years, suffering from a second attack of rheumatism. In addition to the joint inflammations, there were angina, acute mitral and aortic endocarditis, pericarditis, and bronchopneumonia. Toward the end of the second week of his illness he had a convulsion, following which there was œdema of the left arm and left side of the neck. Before death, three days later, there were many severe, general convulsive seizures, and double hydrothorax developed. At the autopsy, in addition to the bronchopneumonia, endocarditis, and pericarditis, there were found thrombosis of the vena cava superior, and of the left jugular and subclavian veins. No cerebral lesions were found to explain the convulsions that were probably due to the disturbed cardiac action, the impaired circulation in the brain, and perhaps to involvement of the vagus, for this was found the seat of a neuritis. The thrombosis was apparently the result of an inflammation of the vein, as an endophlebitis and periphlebitis were present.

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[1] Berliner klin. Wochenschrift, April 21, 1902.

[2] Deutsche med. Wochenschrift, June 26, 1902.

Treatment of Rheumatism. Menzer,[1] who inclines to the view that the micro-organism of rheumatism is not a specific germ but a streptococcus, perhaps a modified one, has had prepared a serum, using organisms taken from the throats of rheumatic cases. The beneficial effects that he obtains are not sudden or striking. In fact, he does not claim that the disease is cut short; but he does believe that his serum has a peculiar or specific effect as seen in the reaction that occurs. This consists in a rise of temperature soon after an injection of the serum, a greater painfulness and swelling in the affected joints, with some increase in the general malaise. Skin eruptions are occasionally seen. The curative benefit, Menzer believes, is largely seen in the absence of relapses so often met with in patients treated with salicylic acid. The cure depends, he thinks, on a strengthening of nature's method of cure by reaction on the part of the body.

Lindemann[2] describes various devices by which, through heat, light, and electricity, rheumatism, gout, sciatica, etc., may be beneficially treated. For the details, with figures illustrating some of the methods, the original papers should be consulted.

Thomas[3] finds that aspirin[4]—acetyl salicylic acid—in doses of 10 to 15 grains every three to six hours, is efficient in rheumatism. He regards it as preferable to the salicylate of sodium, as it is less irritating to the stomach, of pleasanter taste, and, because of its more gradual absorption, not so liable to overwhelm with unpleasant or even serious toxic effects. He has seen no tinnitus, or depressing effect upon the heart.

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[1] Zeitschrift f. klin. Medicin, Band xlvii., Heft 1 und 2, p. 109; also, Therapie der Gegenwart, July, 1902.

[2] Prager med. Wochenschrift, March 13, 1902, April 3, 1902, etc.

[3] Virginia Medical Semi-Monthly, February 7, 1902.

[4] PROGRESSIVE MEDICINE, December, 1902, p. 331.

ANTISTREPTOCOCCIC SERUM IN RHEUMATISM.[1] A case of recovery from a multiple arthritis after the injection of the antistreptococcic serum is reported by Chipman.[2] In its sharp remissions and repeated chills the case might be looked upon as conforming rather to the clinical type of a cryptogenetic septicopyæmia than to true rheumatism, as which latter disease it is regarded by Chipman. No bacteriological examinations were made, and, unfortunately, even had they been made there is such lack of exact knowledge as to the causal organism in rheumatism that it would be a difficult matter to decide definitely as to the real nature of the case. It but illustrates the difficulty one experiences in differentiation when there is no fixed and absolute etiological standard by which a given case may be judged.

TETANUS.

During the last year no striking articles have appeared regarding tetanus. Practically the same views hold concerning its bacterial and toxic character that obtained a year ago. There is the same belief in the peculiar affinity of the toxin for the nerve cells.

The antitoxin treatment of tetanus is still *sub judice*. This certainly holds true for the treatment in cases that have advanced beyond the period of incubation. Numerous reports have been made of failure to cure by the use of the antitoxin, while others report successful cases. There are, however, reports of some unfortunate accidents that carry with them their own lessons. I may here refer to the tetanus that developed in St. Louis following the use of diphtheria antitoxin, the antitoxin having been obtained from a horse that later died of tetanus.

There are also a few reports of tetanus that has appeared following vaccination, where it would seem as if the child had been inoculated with tetanus at the time of vaccination or that through the wound the child had later become infected. And there are several reports of tetanus developing after the injection of gelatin.

Tetanus after Gelatin Injections.[3] During the past year a number of cases have been reported in which tetanus developed after the subcutaneous injections of gelatin.

To obviate this danger Krause[4] advises fractional sterilization by steam at 100° C. for half an hour on five consecutive days. He claims that this not only sterilizes the gelatin, but in no way interferes with its hæmostatic properties. These, he says, are far too valuable to be given up, because of the few unfortunate accidents that have been reported and which can by his method be avoided in the future.

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[1] PROGRESSIVE MEDICINE, December, 1902, p. 381.

[2] Medical Record, February 1, 1902.

[3] PROGRESSIVE MEDICINE, December, 1902, p. 75.

[4] Berliner klin. Wochenschrift, July 21, 1902.

Tetanus after Injections of Quinine. An instructive lesson is taught by a report by Moty.[1] In the French Army in the colonies six cases of tetanus were found which had developed after the injection of strong solutions of quinine used in the treatment of malaria. This quinine was a 20 per cent. solution, and on examining the bodies after death it was found that the alkaloid had crystallized out, and was rolled together in a thick mass. Where weaker solutions had been employed there was no such finding post-mortem. Moty calls attention to the fact that where foreign bodies or blood clots are present in the tissues the tetanus germs seem to find conditions favorable for development. He, therefore, advises that no stronger solutions than 10 per cent. of quinine should be employed subcutaneously.

Tetanus after Vaccination.[2] Achmetjew[3] reports the case of a previously healthy boy, who, soon after vaccination, suffered a blow that fell directly on the vaccine pustule. A new pustule formed. Four days later typical tetanus appeared without much temperature. Antitetanic serum was freely used, but the boy died within twenty-four hours after the onset of the symptoms of tetanus.

Findlay[4] also saw tetanus develop in a woman who was vaccinated on the leg, careful antiseptic precautions being observed. Twelve days after, tetanus appeared, recovery ensuing under the chloral treatment. As no other cases followed vaccination by lymph taken from the same calf, Findlay is inclined to regard the case as possibly one of the so-called idiopathic cases, or, more likely, due to the fact that the bacilli were present on the skin of the leg prior to the vaccination.

The whole question of vaccination tetanus is considered by McFarland,[5] who, from an analytical study of 95 cases of this complication of vaccination—fortunately, a rare complication—concludes that too much care cannot be exercised in the manufacture of the vaccine tubes or points. For while there is, of course, danger that a vaccination wound may be infected with tetanus after the date of the vaccination, there is greater danger that in the manufacture of the vaccine virus, through hay, manure, and barnyard and stable filth, the virus may be contaminated, and the infection with tetanus may thus take place at the time of vaccination.

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[1] Gazette des Hôpitaux, 1901, No. 98.

[2] PROGRESSIVE MEDICINE, December, 1902, p. 311.

[3] Detskaja Medicina, 1901, Heft 5. Abstract in Centralblatt f. die Grenz. der Med. und Chir., April 25, 1902.

[4] Lancet (London), February 2, 1902.

[5] Journal of Medical Research, May, 1902; also Medicine, June, 1902.

Tetanus after Injection of Diphtheria Antitoxin. It will be recalled that an epidemic of tetanus in St. Louis was traced to the use of diphtheria antitoxin. A committee, consisting of Drs. B. Meade Bolton, C. Fisch, and E. C. Walden, investigated the subject. Their work was carefully done, They had the opportunity of seeing some of the cases, of making autopsies, and of examining the antitoxin. That the Coroner's verdict of censure of the Health Department for carelessness in the preparation of the antitoxin and in issuing the same was justifiable seems proven by this report. The horse "Jim," from which blood was drawn on August 24 and on September 30, 1901, showed signs of tetanus on October 2, and was at once killed. The serum, prepared September 30th, was some of it labelled with the date of September 30th, and some August 24th. I give the conclusions of the committee verbatim :[1]

"As the result of our investigations we draw the following conclusions :

"The diphtheria antitoxin prepared by the Health Department of the City of St. Louis, and dated September 30th, and some of the serum dated August 24th, were the cause of the recent deaths from tetanus in the cases where this antitoxin was used.

"This antitoxin was sterile, but contained the toxin of the tetanus bacillus in considerable amount.

"There were two different sera issued under the date of August 24th. One portion not containing the tetanus toxin and characterized by other properties, while the other contained the tetanus toxin and was identical with the serum bearing the date of September 30th.

"The most important result we have arrived at is the positive demonstration that the toxic serum dated August 24th and that dated September 30th are identical. From this we conclude that the serum of September 30th was issued without having been tested by the proper methods, and that a part of it was filled into bottles bearing the date of August 24th, or were furnished with labels having previously been stamped with this date. We are justified in drawing this conclusion from two observations. First, that the serum of September 30th was issued before there was time to have performed the simple tests necessary to determine the antitoxin potency of the serum. Second, in the same way serum dated October 23d came into our possession on November 1st. This serum had been issued to physicians by the Health Department, and by them returned to the Coroner. It is obvious from this that no animal experiments could have been made with this antitoxin. As this was the case with the serum of October

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[1] St. Louis Medical Review, November 23, 1901.

23d, it is the natural inference that the serum of September 30th was issued in the same way.

"We must deny any possibility of latent tetanus having existed in the horse 'Jim' from August 24th to September 30th, as no well-authenticated cases have been reported in which the incubation period extended over seven days in experiments directed to test this point. From the nature of the case the period of incubation cannot be determined from clinical observation.

"It therefore follows from this that the serum drawn on August 24th was free from tetanus, but that the serum of September 30th was drawn during the period of incubation, and had it been tested upon animals it must necessarily have revealed its toxic properties."

Infection Through a Salve of secret composition applied to a tuberculous fistula of the foot is reported by Lejzerowicz.[1] Tetanus appeared a few days later, ran a subacute course, with low temperature, and recovery followed, the last spasm occurring three weeks from the initial symptoms. The treatment in this case was by *Pasteur's serum*, begun on the third day. Of the serum, 100 c.c. were used. Chloral was also employed.

Head Tetanus. A review, largely bibliographic, of head tetanus is given by Hugo Neumann.[2] This interesting variety of tetanus was brought prominently before the profession in 1870 by Edmund Rose. A careful search of the literature, however, has revealed the fact that even before this, in the latter part of the eighteenth century, the condition had been described. The cause of the head tetanus is the same as for the general tetanus, namely, the bacillus of Rosenbach-Nicolaier. The pathological changes found post-mortem are identical with those of general tetanus, though degenerative changes have been met with in the nuclei of the cranial nerves. It is found that in these cases the injury is to the head, usually the face, and most frequently close to the eyes. The injury has also been oftenest produced with dull instruments rather than sharp. It has been met with four times as often in men as in women. The age most frequently affected is between thirty and forty years. The symptomatology has been divided by many into two forms—the one, Rose's head tetanus, and the other the form most accurately described by Brunner. In Rose's head tetanus, which is the classical form, the characteristic symptom is the facial paralysis. This usually precedes the spasmodic stage. Commonly all branches of the facial nerve are involved. There is also difficulty in swallowing, which may be slight or extreme, and may amount even to a complete inability to swallow. This causes something of a resemblance to hydrophobia. Difficulty in breathing, often amounting to a severe dyspnœa, is met with in many cases. Some have regarded this as due to the spasm of the larynx; others as a spasmodic contraction of the diaphragm. It is not a constant symptom. Salivation is met with, caused either by the interference with the innervation of the salivary glands, the difficulty in swallowing, or the difficulty in controlling the muscles of the mouth. Other nerves than the facial may be involved in the paralysis. The optic nerve is declared to have been affected in one case, and the external nerves of the eye have been several times involved. Hyperæsthesia and paræsthesia in the distribution of the sensory fibres of the trigeminus have been described. Trismus is marked in this form of disease, as in the general tetanus. In some cases the accessorius has been involved, the head being drawn to one side. There is generally complete failure of the reaction of degeneration in the paralyzed muscles. The sensorium is usually unclouded, except immediately preceding death. Sleeplessness, anxiety, fear, may be seen. Pain is rare. Fever may be absent, may be mild, or may even reach a high point. Complications in the shape of pneumonia and bronchitis are not so uncommon. The pulse is increased in rapidity, and may become very rapid. Albuminuria has been often observed. Profuse sweating has been frequently seen.

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[1] Medycyna (Polish), 1901, Nos. 35 and 36. Abstract in Centralblatt f. Bakt., April 23, 1902, Abtheilung I., Referate.

[2] Centralblatt f. die Grenzgebiete der Med. und Chir., Band v., Nos. 13–15.

The *prognosis* in head tetanus is much better the longer the period of incubation. Where the period of incubation is short, as from three to four days, the disease is apt to be virulent in all its manifestations. An incubation of two weeks or more is far more favorable; the average period of incubation is about one week. As has been said, the first symptom is usually paralysis, though trismus and paralysis may appear at the same time. The longer the patient lives after the onset of the symptoms the better is the prognosis. The higher the fever, the more rapid the pulse, the more serious the case. The mortality is about 60 per cent. In the cases in which paralysis fails—that is, cases of the type described by Brunner—the prognosis is a little better. The differential diagnosis presents little difficulty, as a rule. Meningitis may be simulated. Rabies may be thought of, and inflammatory processes in the temporomaxillary articulation have to be excluded.

In the treatment nothing new has been found; it is the treatment of tetanus in general.

A word should be said regarding the cases described by Brunner. Neumann is inclined to make two groups of head tetanus—the one the classical form, whose description has just been given, and the other described by Brunner, in which, following an injury to the head, there are spasms of the muscles, limited at least, at first, to the head and face, but no facial paralysis.

A most interesting case of cephalic tetanus has been described by Bourgeois.[1] The interesting feature of this case was that a woman, falling upon a stone floor, scraped the skin off the root of the nose; the trauma involved both sides of the face. Six days later the contracture of the muscles of mastication was marked, and a double facial paralysis appeared. In spite of the intracerebral injection of antitetanus serum the patient died. Little was found except the pigmentation of the nerve nuclei, especially that of the hypoglossus. The unique feature of this case is the double facial paralysis, the injury, as has been said, being upon both sides of the face.

It may be mentioned here, also, that in dogs tetanus has been observed which is generally limited to the head and face. When it is thus limited it is apt to run in dogs a favorable course. This tetanus has been described by Dacourneau Jayles.[2]

Treatment by Tetanus Antitoxin.[3] The use of the tetanus antitoxin has been followed by varying results. A few cases illustrative of several that have been reported during the year are here noticed.

Zelenski[4] had three severe cases in adults. He treated these with *Bujwid's serum.* In one case the injection was made on the fifth day. The patient, however, died. In the other two cases the same serum was used, and recovery followed.

A case in which *Tizzoni's antitoxin* was employed is reported by Dehler.[5] The improvement and ultimate recovery are ascribed by Dehler to the remedy. Pfeiffer[6] has found the mortality of cases of tetanus treated by *Behring's antitoxin* to be 52.7 per cent. With Tizzoni's serum the mortality is 36.3 per cent. Omitting the cases reported by Italian physicians, as he thinks tetanus in Italy runs a comparatively mild course, he finds the mortality to be 46.2 per cent. His own experience with 14 cases, using no serum treatment whatever, compares favorably with that of the specific treatment. Seven of his patients died, making his mortality rate 50 per cent.

Subdural Injection. Von Leyden[7] again urges that the proper method of administering the antitoxin is by the subdural rather than the subcutaneous route. In the case that he reports spinal fluid was withdrawn and the antitoxin injected subdurally. Two injections, each of 5 c.c., were thus made. The case was regarded by von Leyden as an extremely serious one. A prompt drop in the high temperature followed the injections, and the patient made an excellent recovery. In Leyden's case it is interesting to note no wound was discoverable. These cases of so-called idiopathic tetanus are undoubtedly of wound origin, as in the idiopathic erysipelas, where an unrecognized scratch or abrasion, perhaps in the mucous membrane, affords the avenue of entrance for the germs. Cioffi[1] calls attention to the fact that the so-called rheumatic or idiopathic tetanus is in reality of traumatic origin, though the trauma may be slight and may escape detection.

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[1] Gazette des Hôpitaux, 1900, No. 42.

[2] Revue Veterinaire, January 1, 1902.

[3] PROGRESSIVE MEDICINE, December, 1902, p. 394.

[4] Przglad Lekarski, 1902, No. 3. Abstract in Centralblatt f. Grenzgebiet der Med. und Chir., April, 25, 1902.

[5] Münchener med. Wochenschrift, 1901, No. 36.

[6] Zeitschrift f. Heilkunde, xxiii., 2.

[7] Deutsche med. Wochenschrift, 1901, No. 29.

The importance of injecting the antitoxin subdurally is emphasized by one of von Leyden's assistants, Jakob,[2] who reports on 6 cases out of 9 treated successfully in this manner. Some of these were severe, with the high temperature, rapid pulse, and short period of incubation, generally regarded as of bad omen. Such favorable results would seem to warrant even the somewhat serious surgical procedure of trephining, necessary when the cerebral subdural method is advisable. Apparently an early subdural injection of the antitoxin neutralizes the toxin before it has become too firmly attached to, or has too seriously damaged, the cerebral cells.

Behring has urged that the earlier use of the antitoxin and its use in large quantities will give much better results than those thus far recorded. No less than 100 units should be employed, and these within thirty hours of the first symptoms. Moellers,[3] however, from his study of the work of others and from an experience with four severe cases that died in spite of the fact that these suggestions of Behring were acted upon, concludes that we are not yet prepared to state the exact conditions under which recovery may be expected after antitoxin. He thinks that at the time one is able to declare the existence of tetanus, either the body is overwhelmed with the toxin or the toxin has become so firmly united with the cells of vital nerve centres as to be beyond the reach of the antitoxin. He believes, however, that it is the duty of the physician to use antitoxin in every case of tetanus, and also advocates its employment as a prophylactic in the case of unclean wounds. This prophylactic use of the serum is advised by Herhold,[4] who, after losing 3 out of 4 cases of tetanus that he met with in the German Army in China, death occurring though the antitoxin was employed, gave orders that in the case of all wounds that were contaminated with earth 200 c.c. of antitoxin should be given as a preventive. After this order had gone into effect no more cases of tetanus occurred.

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[1] La Riforma Medica, 1902, No. 14.

[2] Leyden's Festschrift, 1902, vol. ii.

[3] Deutsche med. Wochenschrift, 1901, No. 47.

[4] Ibid., No. 30.

In this connection attention may be called to the importance of proper treatment of wounds that are peculiarly liable to be followed by tetanus, such as the toy-pistol Fourth of July wounds. It might be well for the health departments in large cities to do as was done in some cities last year, send out through the lay press certain facts concerning the serious nature of these wounds, often so apparently trifling. The careful removal of all foreign bodies, such as pieces of clothing, bits of the cartridge, dirt, etc., should be insisted upon; the wound should be carefully cleansed with water or some antiseptic solution; bleeding should be encouraged; the wound should not be too tightly bandaged, nor should it be cauterized, because either of these procedures tends to shut up the tetanus germs away from the air, conditions favoring their growth. The people should be taught to consult their physicians for these accidents, and to understand that the doctor who lays open the small wound by a free incision and does not tightly stitch or seal it up has a good reason for so doing, and may save his patient from lockjaw.

The prophylactic use of tetanus antitoxin is also to be regarded as justifiable in the case of suspicious wounds, such as the Fourth of July wounds just mentioned. The value of prophylaxis is seen in the St. Louis epidemic. Fisch[1] tells of his strong belief that the early use of the tetanus antitoxin on the patients to whom the contaminated diphtheria antitoxin had been given prevented the development of tetanus in these individuals. While the use of the tetanus antitoxin seemed without effect after the symptoms were once well marked, in none of the patients treated prophylactically did the disease develop.

The uncertainty of the result in the treatment of tetanus by antitoxin is well shown by Ullrich's[2] report of 9 cases, 4 being handled in the surgical clinic in Breslau, and 5 in the medical clinic. The 4 cases treated by the surgeons died, though Behring's advice as to large and early doses was carefully followed. In the medical clinic of 2 cases treated by the subdural method 1 died and 1 recovered, though no serum was employed in either case before the third day. One patient recovered with no serum. Another recovered, though the serum was given very late. One patient, receiving no serum, died.

Death from Tetanus Antitoxin. Di Gaspero[3] describes a case in which he believes the antitoxin employed, which was Behring's (dried preparation), was responsible for the death; altogether, he used 180 antitoxin units. Following the injection there was a rise in the temperature, increase in frequency of pulse, cyanosis, and gallop rhythm. He believes that sepsis should be ruled out, though this question is certainly far from being decided positively by the report he gives. The patient had been ill for several days before the antitoxin was used, and the symptoms did not appear until twenty-five days after the injury, when they were, at first, taken for hysterical pseudotetanus.

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[1] Interstate Medical Journal, December, 1901.

[2] Mittheilungen a. d. Grenzgeb. d. Med. u. Chirurgie, 1902, x. p. 120.

[3] Die Therapie der Gegenwart, 1902, p. 139.

CARBOLIC ACID IN THE TREATMENT OF TETANUS. Baccelli's method of treatment by the injection of carbolic acid (a 1 to 2 per cent. solution of carbolic acid injected subcutaneously, even up to 3 grammes daily, can be given; in general, 1 ctg. to 1 kg. of body weight) has had some adherents. Enriquez and Bauer[1] injected 2 c.c. of a 2 per cent. solution on the fourth day in a case where the previous use of chloral and antitoxin had produced no favorable results. This dose was repeated on each of the three following days, and venesection was also employed. The authors ascribe the muscular relaxation and improvement that followed to the use of the carbolic acid. Death occurred later from a complicating pneumonia. Cioffi[2] believes the treatment by Baccelli's method is superior to others, though in experimental tetanus and in fulminant human cases it has proven ineffectual.

Delore[3] also had a successful case treated by Baccelli's method, in which in the aggregate a large amount of the 2 per cent. solution of carbolic acid was employed, the injections being made deep into the muscles. In the wound, which was a bullet wound, tetanus bacilli were found. The whole course of the disease was, however, a mild one, and, as Delore himself says, it is difficult to say how much of the good result is to be attributed to the treatment, as not a few of the cases with a long period of incubation, low temperature, and moderately slow pulse recover under any treatment.

Copetti[4] also reports 2 cases of traumatic tetanus in which recovery followed the carbolic acid treatment of Baccelli.

J. N. Henry[5] used 303 grains of carbolic acid hypodermically in treating a case of tetanus in a young man, aged nineteen years. The tolerance of a patient with tetanus for carbolic acid is shown, as no smokiness of the urine appeared. While some lessening of the convulsions occurred, the case resulted fatally.

SALT SOLUTION IN TETANUS. Some interesting experimental work on the washing out of the body by normal salt solution is reported by

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[1] Société médicale des hôpitaux, December 20, 1901.

[2] La Riforma Medica, 1902, Nos. 14–16.

[3] Gazette des hôpitaux, 1900, No. 100.

[4] Gazetta degli Ospedali (Milan), March 16, 1902.

[5] American Journal of the Medical Sciences, December, 1901.

Tonzig.[1] His experience is with tetanus in rabbits. More than the ordinarily fatal dose of strychnine, chloral, etc., was tolerated by the animals if the salt solution were employed in the experiments of Sanquirico. Tonzig, however, was unable, in the case of experimental tetanus produced in varying ways and under varying conditions, to see any good results follow the use of the salt solution. The close union of the poison with the cell seemed to him to operate against the success of this method of treatment.

TYPHOID FEVER.[2]

Historical Review. In the Milroy lectures on the etiology of typhoid fever and its prevention, Corfield,[3] in an historical review, calls attention to the work of Mayr and also to that of Hildebrand. These writers, the former's work heretofore overlooked, appear to have made even before the time of Louis a fairly clear clinical differentiation between typhus and typhoid. The work of Louis, Chomel, Barlow, Jenner, Gerhard, Pennock, Murchison, Budd, and others is well discussed, the first lecture being an excellent historical introduction to the study of this disease. Numerous outbreaks are described, showing the mode of origin by the contamination of the drinking-water or the milk.

Origin of Epidemics. During the past year several epidemics of typhoid have been reported. It is perhaps unnecessary to call attention to the manner of origin of such epidemics, as the subject has been so frequently referred to. Yet the matter of prophylaxis is of such importance that each one of these epidemics is instructive. I will refer to two particularly striking instances. Harriman[4] describes 65 cases that developed in a school where the sewage and sewage disposal and the water supply were perfect. But about September 15th a new milkman began to supply some of the milk, and three weeks later three cases of the fever developed, and others continued to do so until eighteen days after this milk supply was discontinued. There had been a case of typhoid fever in the milkman's family a few months before, and on investigation it was found that this particular milkman rinsed his cans with water from two wells, one of which contained a large amount of organic matter and a very large number of germs, among them one corresponding to the typhoid bacillus. He had not scalded the cans after washing them. The milk from this particular supply was furnished students sitting at certain tables. Most of the cases were among these students. A particularly striking fact was that sixteen young men in training for football drank daily double portions of this milk. Of these 16, 13 contracted typhoid.

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[1] Münchener med. Wochenschrift, 1901. No. 41.

[2] PROGRESSIVE MEDICINE, December, 1902, p. 307.

[3] Lancet, March 22, 1902.

[4] Journal of American Medical Association, February 22, 1902.

At a small resort in Northern Michigan 35 cases of typhoid fever appeared among those who took their meals at a certain hall. The origin of the epidemic is reported by Rachford.[1] A formal search was made for the source of the infection. The general water supply of the town, the milk supply, the water of the bay, where the resorters bathed, were all excluded by a careful study of the facts surrounding each individual case and the cases collectively, and then a search was made for the source of the local contamination of the water or food supply. It was found that a manhole receiving the sewage and kitchen sewage from the dining hall was not far distant from two water-tanks, in one of which vegetables and fruits were placed for cooling, and from the other water for drinking purposes was obtained. This manhole or cesspool was made of brick and not cemented. The water-tank was made of wood. On pumping out the latter, water from the manhole was seen to ooze through the intervening six feet of soil. The defects were corrected, and the epidemic ceased abruptly after nineteen days. The original case of typhoid was believed to have been one which occurred in the building several months before.

An interesting and instructive study of typhoid fever in Kleinbasel, which is just across the Rhine from Basel, has been made by Lotz.[2] He shows that there was no relation to the ground-water to be made out. The local epidemics affecting Kleinbasel and sparing Basel could be traced directly to the local water supply. A certain pumping station being shut down for repairs, a sudden drop in the number of cases of typhoid followed, showing that water from this station was evidently polluted.

Diagnosis. BACILLI IN THE ROSE SPOTS. Several investigators have cultivated typhoid bacilli from the rose spots. Polacco and Gemelli[3] have been able to do so, and regard this as a rapid and simple method of diagnosis. I would call attention to the fact, however, that as the rose spots do not ordinarily appear before the eighth day, and in doubtful cases are even absent, this method does not permit of application in every instance, and is not always easy of application, particularly where one is at a distance from the services of an expert bacteriologist.

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[1] Medicine, December, 1901.

[2] Zeitschrift f. Hygiene und Infectionskrankheiten, xli., 2.

[3] Centralblatt f. innere Medicin, 1902, No. 5.

Nor is the method proposed by Heneage Gibbes[1] likely to be adopted in general practice, even though his statements should be confirmed by others. Gibbes claims that by proper photographic methods the spots can be detected in the photograph earlier than they can be seen by the naked eye. For a description of his method, the reader is referred to the original article.

Seemann,[2] in 34 cases of typhoid fever, examined the rose spots for typhoid germs. He was able to cultivate them in 32 of these cases. His technique was that of Neufeld. A drop of bouillon was placed over the sterilized skin and the spot opened by an incision made through the bouillon, some of the fluid from the roseolous lesion being squeezed out and mingling with the bouillon, which was now examined by the ordinary cultural methods for typhoid bacilli. His conclusion is that E. Fraenkel's theory as to the bacillary origin of the roseolæ receives support by these examinations. He also regards the operation as a simple one, and in its results as valuable as an early means of diagnosis as the Widal test. While not wishing to underestimate the value of the examination of the rose spots as a diagnostic measure, I would call attention to the fact that it is not of easy application under all circumstances in private practice, that it is inapplicable where no spots are present, and that the spots do not, as a rule, appear before the seventh to the tenth days. Further, where one is competent to make the bacteriological examination he is prepared to examine the blood taken directly from the vein for the presence of bacilli. Negative results in examining the roseolæ cannot be given much weight. Seemann found that in some cases as many as five rose spots had to be examined before the bacilli were found. He also learned that the rose spot must be quite fresh, as when old the bacilli seemed to be so weakened as not to grow on artificial culture media. This method of diagnosis, therefore, while of great value in certain cases and under proper circumstances, is not without some rather serious limitations.

Burdach[3] reviews the subject of the detection of typhoid bacilli in man, citing the work done in the recognition of the germs in the cadaver, in the stools, the blood, the roseolæ, the spleen, the urine, and in pus that may appear during the course of the disease. In his own work on 25 cases of typhoid he was successful in identifying the typhoid bacilli in some one of these situations in only 18. He concludes, therefore, that while the Widal reaction is sometimes unreliable and misleading, it is yet, as compared to the detection of the germs themselves, of greater value. The proper method, it seems to me, is the one advocated by Higley, to examine both for the bacilli and for the Widal reaction.

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[1] British Medical Journal, March 22, 1902.

[2] Wiener klin. Wochenschrift, May 29, 1902.

[3] Zeitschrift f. Hygiene und Infectionskrankheiten, xli., No. 2.

BACILLI IN THE SPUTUM. Dehle[1] has found in the sputum of typhoids the specific germ of the disease, frequently, of course, associated with other micro-organisms. He also believes that he has detected typhoid bacilli in the sputum of cases regarded as simple bronchitis. If this should be confirmed, his observations will have an important bearing on the method of the spread of typhoid fever and the necessity of prophylaxis against the sputum. In one autopsy a lobular pneumonia and pleurisy were, he believed, the primary affections.

In this connection it may also be well to note that Wasdin[2] believes that the primary typhoidal localization may be in the lung.

THE SERUM DIAGNOSIS. Higley[3] compares the Widal reaction with the detection of typhoid bacilli in the stools. Adopting the method recommended by His,[4] with a modification of the plating medium, he finds that during the second week of typhoid the isolation of typhoid bacilli from the feces gives slightly better results than does the Widal test. He advocates the employment of both tests, believing that in this way material aid is given in the diagnosis of the disease previous to the appearance of distinctive clinical symptoms. The new plating medium devised by His is composed of agar, 15 grammes; gelatin, 15 grammes; sodium chloride, 5 grammes; glucose, 10 grammes, and water, 1000 cubic centimetres. With this plating medium and the isolation method of His, the detection and isolation of the typhoid bacilli are, to one familiar with the bacteriological methods, simple, reliable, and practical.

Libman[5] reports on an experience with 3514 Widal tests made at the Mount Sinai Hospital, New York. He gives details as to the technique of the preparation of the culture. A dilution of 1 to 20 was employed. When this proved positive a second test with 1 to 50 was commonly employed. A time-limit of twenty minutes was the rule. A positive reaction implied not only clumping but cessation of all motility, though a few non-motile bacteria or one or two motile ones in a field were disregarded. "Partial," "suspicious," or "incomplete" reactions are valueless, as they occur in many diseases. In no disease other than typhoid did he find a positive Widal reaction, though examinations were made in 526 cases of diseases other than typhoid. In 334 cases the disease was typhoid fever. The reaction was found in 94.1 per cent. of the cases. With cultures incubated at 35° C. better results were obtained than at 37° C. The reaction was found by the end of the first week in only 5.7 per cent.; by the end of the second week in 36 per cent.; third week, 67 per cent.; thirtieth day, 92 per cent. The earliest day was the third, the latest the sixty-seventh—*i. e.*, the latest day on which the reaction first appeared. Libman has noticed, as have others, the sudden disappearance of the reaction during the course of the disease. The test is of no value as regards prognosis.

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[1] Wiener klin. Wochenschrift, February 27, 1902.

[2] American Medicine, February 8, 1902.

[3] Medical News, January 11, 1902; also, Medical News, March 29, 1902.

[4] Journal of Experimental Medicine, 1897, vol. ii., No. 6.

[5] Medical News, March 29, 1902, p. 588.

TYPHOID BACILLI IN THE BLOOD. Cole's observations on the presence of typhoid bacilli in the blood were referred to in the volume of last year. Courmont[1] has reached similar conclusions, and believes that in all cases, at some time during the course of the disease, typhoid bacilli can be recovered from the blood. He has found them even as early as the fifth day, and even before the blood has acquired agglutinating power. He regards the examination of the blood for the bacilli as of diagnostic value in cases where the Widal reaction is absent. His uniform success in his experiments can be attributed to the fact that he uses a large amount of blood, two or three cubic centimetres, but dilutes with one hundred or more times the amount of broth. He thus secures the requisite number of bacilli and overcomes the bactericidal power of the blood.

DIAGNOSIS FROM APPENDICITIS. Dr. Maurice H. Richardson[2] writes a very interesting and practical article on "Diagnosis between Acute Appendicitis and Some Atypical Cases of Typhoid Fever." After calling attention to the unfortunate circumstance that every once in a while a case of suspected appendicitis is shown by operation to be typhoid, and also that cases supposed to be typhoid turn out to be appendicitis, he emphasizes the great importance to the surgeon of familiarity with typhoid and other zymotic diseases, which familiarity can only be gained by general practice. In doubtful cases the surgeon should always have at hand the services of the physician. Without going into the details of the cases recited by Richardson, all of which are very instructive, I will refer to the stress he lays upon the four symptoms of pain, tenderness, muscular rigidity, and fever. It is upon a combination of these four conditions in varying degrees that the diagnosis of appendicitis in a suspected case must be made. The facts which Richardson believes should be emphasized I give practically in his own words: "Without pain at some time in the course of the disease there can be no acute surgical lesion of the abdomen; temperature with pain, but without rigidity or tenderness, means typhoid fever or simple continued fever; very high temperature should excite suspicion if pain and tenderness are present, but not marked, for acute appendicitis has usually a moderate temperature ; a soft abdomen with a high temperature is a suspicious combination, even if there is pain and tenderness; when typhoid is suspected the pain and tenderness must be distinctly localized in the appendix, and confirmed by rigidity, resistance or tumor, before operation for appendicitis is justifiable.

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[1] Journ. de Phys. et Path. gén., January 15, 1902, iv. pp. 154-170.

[2] Boston Medical and Surgical Journal, January 9, 1902.

"When there is doubt as to typhoid, the operation should be postponed if constitutional signs are severe and local ones hard of detection. When the abdominal symptoms—pain, tenderness, rigidity, with or without distention—call loudly for operation, the abdomen must be opened in spite of the possibility of typhoid; but cases suggesting typhoid as strongly as appendicitis should, until the diagnosis is perfectly clear, be carefully observed."

One great value attaching to Richardson's communication is the frankness with which he admits the possibility of error on the part of the experienced physician or surgeon.

Complications. CEREBRAL ABSCESS DUE TO TYPHOID BACILLUS. McClintock[1] reports from Hektoen's laboratory a case of brain abscess occurring during the course of typhoid fever, and due to the bacillus typhosus. While not a few cases of meningitis due to the typhoid bacillus have been put on record, no previous case has been reported in which an abscess of the brain has been proved to be due to this germ. Though McClintock finds records of 5 other cases of cerebral abscess during typhoid fever, the bacteriological proof is lacking, except in one that was due to the staphylococcus pyogenes aureus. In the present case the patient, a single woman, aged forty-nine years, ran the typical course of an ordinary typhoid, with spots, Widal test, etc. During the fifth week the temperature was somewhat erratic, and the patient was quite nervous, having a dread of being left alone even for a moment. On the thirty-third day of the disease she awoke from a sleep, talked incoherently, vomited, and soon had a convulsion, epileptiform in character, followed by two others. The more pronounced involvement of the right side than the left in the convulsive movements was remarked by her attending physican, Dr. H. G. Willard.

Following this there were amnesic aphasia, varying in degree from time to time, more or less headache, occasional vomiting, temperature and pulse often normal. On the fifty-ninth day the temperature rose, the headache grew worse, speech became incoherent, stupor came on, Kernig's sign was present. There was some tendency to spasm in the right arm. With some variation in the symptoms there was gradual failure, and death on the sixty-sixth day. The autopsy showed a suppurative basilar meningitis, abscess of the left temporal lobe, purulent exudate in the lateral ventricles, healing typhoid ulcers in the ileum. From the pus in the abscess and from the meninges a pure culture of a bacillus answering in all particulars to the typhoid bacillus was obtained. Full details of the bacteriological identification are given in the article.

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[1] American Journal of the Medical Sciences, April, 1902, cxxiii., No. 4.

MENINGITIS DUE TO THE TYPHOID BACILLUS. In the same number of the same journal[1] is an abstract of an article by Guinon,[2] reporting the case of a child suffering from typhoid fever in whom early in the disease there had been some rigidity of the neck, but because Kernig's sign was at that time not present the thought of meningitis had been dismissed. Several days later Guinon saw the patient. At this time the symptoms of meningitis were marked. By lumbar puncture a serous fluid containing typhoid bacilli was obtained. The child ultimately died.

TYPHOID BACILLURIA. The occurrence of typhoid bacilli in the urine of patients suffering from typhoid fever has received notice in previous issues of PROGRESSIVE MEDICINE. Its great importance justifies further reference to the subject even at the risk of repeating some of the points already emphasized. I may, perhaps, with propriety quote what I have written elsewhere in commenting on this subject:[3]

"The presence of typhoid bacilli in the urine of a patient ill with enteric fever is important, not only to the patient and his friends, but to the entire community in which he lives. It is important to the patient because it may mean a cystitis, a pyelitis, a prolonged convalescence, or an imperfect restoration to health. Occurring as it does, in about 25 per cent. of cases, it should be carefully sought for by the physician, and every typhoid urine that is even slightly turbid, or that is voided with evidence of slight pain or local irritation, should be examined for bacilli. But this is not enough, for in many of these cases no evidence of the presence of bacilli is given by turbidity of the urine or disturbed act of micturition. In fact, subjective complaint is the exception. Typhoid cystitis, as shown by Curschmann, is relatively rare. The only safe way, therefore, is to examine the urine of every case, not forgetting that the organisms are often late in making their appearance, and are seldom found before the third week. Their early detection and the proper treatment may save the patient from annoyance, and perhaps from something more serious, such as renal or vesical calculi, for the typhoid bacillus may, perhaps, play a rôle here as it does in the production of biliary calculi.

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[1] American Journal of the Medical Sciences, April, 1901, cxxiii., No. 4, p. 718.

[2] Revue Mensuelle des Maladies de l'Enfance, November, 1901, p. 529.

[3] Journal of American Medical Association, March 9, 1901, p. 669.

"It is important to detect these cases, because of the great danger of spreading the disease by means of careless disposal of contaminated urine. Neufeld[1] has presented this aspect of the case with unusual force, and he contends that the danger from infected urine is greater than from feces similarly contaminated. This arises in part because a given quantity of urine will contain, as a rule, a larger number of typhoid germs than will a similar quantity of feces. In one of Neufeld's cases he estimated the bacilli at one hundred millions per cubic centimetre. But another reason is that an article of clothing, a sheet, a bed-pan, a urinal, the hands or genitalia, may be soiled with urine, and the accident much more readily escape notice than a similar mishap with fecal matter, thus increasing the danger of spread of the disease to those caring for the patient. From the point of view of public health the danger from improper disposal of typhoid urine is great. Water fouled with fecal matter will give evidence to sight or smell more quickly than if the contaminating substance is the nearly colorless and less malodorous urine. Urine is more apt to be carelessly thrown out than are feces; a patient recovered from typhoid, especially if he be in the country, is more likely to urinate carelessly than to defecate, near a spring, well, brook, stream, or pond, and thus to infect the drinking-water. And the bacilli remain for a much longer time in the bladder and, therefore, in the urine, than in the intestine and the feces. In Gwyn's case they were found in urine voided five years after the attack of typhoid. There seems to be a constant inoculation and re-inoculation of the urine as it comes from the kidney by the organisms present in the bladder, so that the culture medium being constantly supplied, the growth is repeatedly transplanted, and is slow to die out. Thus a patient, months or years after his attack of fever, may unwittingly infect a supply of drinking-water and start an epidemic of the disease."

Fuchs[2] found, in examining the urine of 41 cases of typhoid, that bacteria were present fourteen times. In 4 of these cases there were present in the urine large numbers of typhoid bacilli. The use of urotropin when there was typhoid bacilluria caused a prompt diminution in the number of germs present. He found, however, that the remedy had to be repeated in order to cause their permanent disappearance. Upon germs other than the typhoid bacilli the effect was not so marked.

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[1] Deutsche med. Wochenschrift, December 20, 1900.

[2] Wiener klin. Wochenschrift, 1902, No. 7.

Schüder[1] found the typhoid bacilli in the urine of 5 out of 22 cases, or in 22.7 per cent. He finds them often in enormous numbers, and generally in connection with albuminuria. They are commoner during convalescence, but may appear during the course of the disease. Adding up the statistics of 19 observers, Schüder finds that in 599 observed cases typhoid germs have been found in the urine in 177, or in 29.55 per cent. He reiterates the importance of disinfecting the urine of typhoid patients, even into late convalescence, and calls attention to the ease with which the water used in bathing the sick—we assume he refers to the tubbing of the Brand method—can become a source of danger, as patients so frequently urinate during the bath.

Brüsing[2] also refers to the danger of polluting drinking water by the typhoid convalescent, who, while bathing in the stream or pond, urinates in the water. He found in the urine of a soldier, whose convalescence had begun sixteen weeks before, that there were myriads of typhoid germs, though the man was up and about and making practically no complaint of ill-health. He confirms the observation of so many as to the efficacy of urotropin in causing prompt disappearance of the bacilli from the urine.

Ichikawa and Kabaike[3] found in the urine of 24 typhoids in Japan that bacilluria was present in 15 cases, or 62 per cent. The bacilli appeared generally between the second and fourth weeks. They disappeared spontaneously in three cases on the fortieth, forty-third, and forty-eighth days of the illness, respectively. Urotropin was found of service in the other cases.

ANGINA TYPHOSA. Bendix and Bieckel[4] report a case of angina typhosa. The sore was accompanied by a distinct ulcer which took ten days in healing. No scar was visible after the healing. From the ulcer typhoid germs were cultivated. It was to be looked upon, therefore, as a true typhoid lesion. The authors call attention to the importance of antisepsis of the mouth in typhoid fever.

NOMA IN TYPHOID FEVER. Noma is a rare complication of typhoid fever. Sailer[5] reports 2 cases occurring in brother and sister. They, with another brother, were admitted to the hospital, all suffering from typhoid fever. The previous summer one of the brothers had had diphtheria, from which he had apparently completely recovered. Toward the end of the typhoid infection the sister and the brother who had had diphtheria developed necrosis of the jaw, followed in the brother's case by typical cancrum oris. Diphtheria bacilli were obtained from the necrotic and gangrenous areas in each case. The boy died, the girl recovered. In each case antitoxin was used. Sailer points out the probable relation between the diphtheria of a few months before and the later development of noma, the diphtheria germs being aroused to new activity and able to produce necrosis in tissues whose vitality was lowered by the typhoid infection. He calls attention to the fact that others have found the diphtheria bacillus in cases of noma, though he, as others have done, overlooks an article by Bishop and Ryan, in which diphtheria bacilli were found in a case of noma. The paper was presented to the Chicago Pathological Society, October 10, 1895, and is found in the *Transactions* of that Society, vol. i. p. 252; also in the *Journal of the American Medical Association*, 1895, vol. xxv. p. 1043. This, it will be noticed, is three years before the article of Freymuth and Petruschky, referred to by Sailer as the first one in which attention was called to the possibility that noma, in some cases, may be due to the diphtheria bacillus.

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[1] Deutsche med. Wochenschrift, 1901, No. 44.

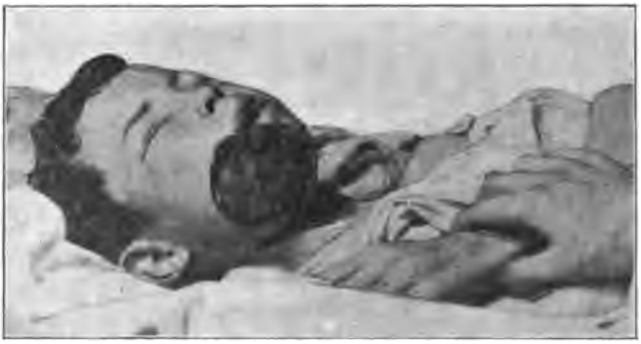
[2] Ibid., 1902, No. 25.

[3] Tokio-Iji-Shinshi, September, 1901. Abstract in Central. f. Bakt., xxxi., No. 5, p.146.

[4] Deutsche med. Wochenschrift, January 5, 1902.

[5] American Journal of the Medical Sciences, January, 1902, cxxiii., No. 1.

FIG. 6.



Noma in typhoid fever. (Sailer's case.)

THYROIDITIS. Robertson[1] writes on inflammation of the thyroid gland as a complication of typhoid fever. Inflammation of the thyroid is not uncommon in those localities where goitre is endemic, occurring as an acute condition in a gland the seat of a previous hypertrophy. As a complication or sequela of typhoid fever it is comparatively rare. The case reported by Robertson concerned a man, aged forty-two years, who was convalescing from typhoid. He complained of difficulty in swallowing; the thyroid became acutely enlarged, particularly the right lobe, which was tender and gave a sense of semifluctuation. He had a slight chill, moderate elevation of temperature, and was annoyed by a feeling of constriction about his throat, with dysphagia. Dyspnœa was slight. Owing to the pain he held his head quite rigidly. With the subsidence of the swelling the symptoms gradually vanished, and the process terminated without suppuration after about ten days.

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[1] American Journal of the Medical Sciences, January, 1902.

Robertson refers to the fact that when the left lobe of the thyroid is particularly implicated, dysphagia is apt to be more pronounced, owing to the greater opportunity for pressure because of the left lateral deviation of the œsophagus.

The complication is oftener met with during convalescence than at the height of the typhoid.

The prognosis is good. Threatening symptoms are unusual and fatalities are among the greatest rarities. Permanent enlargement of the thyroid seldom results. The course of the attack is generally from ten to fourteen days.

The treatment should be the local application of ice, and where suppuration has occurred the evacuation of the pus.

MASTITIS. Among the rarest complications of typhoid fever is mastitis. Last year the case of Davis, Peterson and Hewlitt was reported in PROGRESSIVE MEDICINE in the department of Surgery of the Head, Neck, and Chest. Since then McCrae[1] reports 3 additional cases occurring in Osler's wards.

The first case, a colored woman, aged twenty-seven years, whose youngest child was five years old, had a typical attack of typhoid, with spots, enlarged spleen, and Widal reaction, the course of the disease being severe. On the twenty-ninth day an indurated mass, painful and tender, was noted in the left breast. The leucocytes rose from 4000 to 8000; the temperature increased, and on the thirty-fifth day, by operation, pus was obtained. On the forty-sixth day the temperature was normal.

The second case was a married woman, aged twenty-five years, who had nursed a child eight months before. She had typical typhoid; the leucocytes were 3300. On the thirteenth day of the disease there were pain and induration in the right breast; leucocytes 8000, and rising later to 10,000. A little later there was pain in the left breast, with induration. Neither breast suppurated. The patient suffered a typical typhoid relapse on the fifty-second day, and she again complained of pain in the left breast; the temperature rose as high as 103° F., and the leucocytes increased to 18,000. No suppuration occurred.

The third case was a woman, aged thirty-two years, who had nursed a baby up to the day of admission. The child had symptoms of gastroenteritis, but its blood did not give the Widal reaction. On the thirtieth day of a typical typhoid, and when her temperature had been normal for three days, there was pain in the right breast, followed by swelling and fluctuation; leucocytes 8000. Pus was obtained from the breast, and from this, cultures of the staphylococcus albus, but no typhoid bacilli.

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[1] Johns Hopkins Hospital Bulletin, January, 1902.

The conclusions which McCrae reaches from a study of his cases and those reported by others are: 1. Mastitis is a rare complication of typhoid fever and usually occurs late in the attack. 2. It occurs in both sexes, and is apparently not associated with a functionating gland. 3. Both breasts are involved in about half the cases. 4. Suppuration occurs in about half the cases, and may be associated with the typhoid bacillus or the staphylococcus. 5. It is of no special moment in the prognosis.

HYPERPYREXIA. A case of typhoid, with the unusually high temperature of 108° F. (rectal), is reported by Perekhan.[1] Notwithstanding the hyperpyrexia, intestinal hemorrhage, and two relapses, the patient made a good recovery.

FECAL IMPACTION. Henry[2] calls attention to a very practical point, the danger of impaction of hardened fecal matter in the large intestine of patients ill with typhoid fever. The danger is not absent even in some cases with diarrhœa. Overfeeding with milk he regards as a possible cause of this complication. In one of his cases the impaction extended from the anus far up into the large intestine, and could be palpated externally as a series of hard masses. The abdomen was not distended. The bowel was emptied by enemata of oil and by dislodging the masses by means of the finger and a curette. In the other cases calomel, the finger, and enemata sufficed. F. A. Packard is quoted in the same article as having seen four similar cases. I saw a case about six years ago, where, during convalescence from a mild typhoid, fecal impaction was pronounced and necessitated the digging out of the lumps by means of the finger. In this case I thought possibly the large doses of bismuth that had been given for a long period of time might have had something to do with the occurrence of this annoying complication. Closer attention to the bowels, the inspection of the stools, to see if undigested masses of casein are passing, careful daily palpation of the abdomen, with enemata given daily or every other day in all cases where the evacuations are not satisfactory, will prevent this impaction.

PERFORATION.[3] In a paper read before the Chicago Surgical Society, May 5, 1902, and reported in its *Transactions*, G. E. Armstrong,[4] of

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[1] Chicago Medical Recorder, August 15, 1902.

[2] American Journal of the Medical Sciences, July, 1902.

[3] PROGRESSIVE MEDICINE, June, 1902, pp. 69-72; March, 1902, p. 168.

[4] Journal of the American Medical Association, May 21, 1902.

Montreal, discussed perforation of the bowel in typhoid fever. In 932 cases of typhoid the ileum had been perforated in 34 cases. In 1 case it was not detected until the post-mortem. In 33 cases the perforation was detected during life and the opening closed. Five of the 33 cases recovered. In 1 other case the patient died five days after perforation, and the pathologist reported that death was due to a typhoid toxæmia and not to perforation. The recoveries would, therefore, number a little over 18 per cent. Armstrong was not inclined to depend much on the presence or absence of leucocytosis as an aid to diagnosis or prognosis. In his judgment the earlier the interference the better the result.

That early operation is the treatment for typhoid perforation is the consensus of opinion of all who write. The number of successful operations is constantly becoming larger. Méry[1] operated on a child who lived twelve days, dying of bronchopneumonia. Earlier operation Méry believes might have saved her. He refers to two successful cases of Chevalier where prompt diagnosis and early operation had saved the children. Méry further believes, as regards perforation, that the accident is not so infrequent in children as is generally believed, as his personal knowledge of cases in the hospitals of Paris convinces him that this accident is not a rare one. He also advocates, as do many surgeons nowadays, the operative diagnosis in doubtful cases, believing the risk from a simple exploratory incision is less than from waiting and perhaps overlooking the perforation until too late.

The same insistence upon early operation is voiced by Hays,[2] who has operated on seven cases with three recoveries.

It may be well to call attention to two points in the diagnosis of perforation in typhoid, as it may correct an impression that, to a certain extent, prevails among physicians. It is still hard to rid one's mind of the notion that there is always a sudden severe pain, followed by shock or collapse, in a typhoid perforation. This is true of many, perhaps of most cases. But in the dull, almost stupefied condition of many typhoids there may be no complaint of severe pain, and the sudden collapse may not be seen. And even in milder cases, where the mind of the patient is quite active and alert, there may be such slight pain as to attract little attention unless the physician be on guard and carefully investigate the minutiæ. I saw two such cases last summer, in one of which no pain was complained of by the patient, and in the other only an objection to the nurse's sponging over the abdomen. In both cases, however, there was tenderness on pressure. Small perforations, with slow oozing of intestinal contents, may explain the insidious onset of symptoms in some instances. This frequent absence of the sudden pain, the collapse, tympany, etc., is referred to by Shattuck, Warren, and Cobb in a report to the Boston Society for Medical Improvement.

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[1] Presse Médicale, 1902, No. 64.

[2] American Medicine, September 6, 1902.

The other point to which I would make reference is the occasional absence of leucocytosis when perforation has taken place. In one of the cases just referred to there were 3700 and 4000 white corpuscles on two examinations made after the occurrence of the accident. The absence of an increase of polymorphonuclear leucocytes does not, therefore, exclude perforation. This is a fact recognized by almost all writers, yet the notion that hyperleucocytosis is the rule with perforation, and that there are no exceptions, seems to be widespread, and it should be known that occasional exceptions occur.

I might add another thought, impressed upon me by an experience of two years ago. Where perforation is suspected, and where increase in leucocytes lends color to the diagnosis, it must be remembered that complications other than perforation may cause leucocytosis. The experience referred to was in a man, who with some pain in the abdomen, a slight increase in the pulse and temperature, had the leucocytes suddenly mount from 4000 to 12,000. A careful search, however, revealed a small area over the chest, where was heard a pleural friction, and the later developments, including the autopsy, confirmed the diagnosis of bronchopneumonia, with no perforation.

The diagnosis of perforation, then, has to be made not on the presence of any one symptom, such as pain, tenderness, collapse, or leucocytosis, but rather upon the complexus of symptoms, each case being carefully considered individually, and the fact being clearly recognized that there are many deviations from the typical and classical picture of the condition. Osler's[1] note of warning regarding the responsibility resting on the physician who is supposed to be carefully watching a case of typhoid fever, but who through superficial observation or wrong interpretation of symptoms permits a perforation to go unrecognized until too late for a life-saving operation, is well worth repeating verbatim. He says:

"Specific instructions should be given to the nurse in charge of the ward to notify the house physician at once of any complaint of abdominal pain, of hiccough, of vomiting, of sudden rise in pulse or respiration, of unusual sweating, or of signs of collapse. The house physician should bear in mind that perforation is an accident liable to occur in the severe cases, in those with delirium, with diarrhœa, or with hemorrhage, and in those with abdominal symptoms, so that he should be on the watch, and his daily notes should be made with a view of gauging the progress of the symptoms. The following schedule may help him in drawing up his clinical memoranda:

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[1] Philadelphia Medical Journal, January 12, 1901; Lancet, February 9, 1901.

"1. *The Pain.* (*a*) Its onset, whether simply an aggravation of the slight abdominal pain, such as is common with constipation or with diarrhœa, or whether it is a sudden, intense pain, which causes the patient to call out, and which, though relieved by stupes and ordinary measures, recurs in paroxysms and grows worse. (*b*) Its locality, whether in the hypogastric or in the right iliac regions, or in the region of the gall-bladder; whether it is diffused or localized; whether it radiates toward the pubes or to the penis. It is to be borne in mind that abdominal pain of a severe character in typhoid fever may be associated with an acute pleurisy, with a distended bladder, with a packed rectum, or it may follow an enema, or it may occur with acute cholecystitis.

"2. *The State of the Abdomen.* (*a*) Whether flat, scaphoid, or distended, and whether, if distended, it is uniform, or chiefly in the hypogastric region. (*b*) The respiratory movements, whether seen uniformly, and whether below and above the navel. It is to be borne in mind that perforation may be present, with a flat or even with a scaphoid abdomen. (*c*) Palpation. Observe the degree of tension of the abdominal wall, the presence of pain on pressure, the locality of the pain, the extent, the degree of pressure necessary to elicit the pain, and whether it is a pain of increasing severity; the presence or absence of muscle rigidity or spasm, noting particularly its presence or absence in the hypogastric region and in the right iliac fossa. (*d*) Percussion. The character of the note in the front of the abdomen and in the flanks. Auscultatory percussion may be helpful when gas is free in the peritoneum. A flat note in the flanks may be present, due to exudate, within twenty hours of the occurrence of the perforation. (*e*) The liver flatness. Note specifically every third hour after the onset of the symptoms the extent in the middle, nipple, and mid-axillary lines. Remember that obliteration may occur in a flat as well as in a distended abdomen. Complete obliteration in the nipple line may be caused by excessive tympany, but rapid obliteration in a flat or a not much distended abdomen is a valuable sign. (*f*) Auscultation. Note the presence or absence of the signs of peristalsis. A friction may be early, within twelve hours of the onset. (*g*) Examination of the rectum—whether there is tenderness or any fulness between the rectum and the bladder. (*h*) The stools—the character, frequency, and the presence of blood or sloughs. (*i*) The urine—whether pain on micturition, frequency, etc. The onset of symptoms with pain about the bladder or in the penis is not infrequent when perforation takes place in the coils of the ileum in close contact with the bladder.

"3. *General Condition of the Patient.* (*a*) Facies—whether there has been a change in expression; the presence of a risus sardonicus, marked or slight; the onset of pallor or of sweating, and the signs of collapse, as in cold hands, cold feet, and slight dusky suffusion of the face. (*b*) The pulse—whether a sudden change in the rate and force; the very rapid, running, thready pulse may not be present for twenty-four hours after the onset of perforation. (*c*) The temperature—whether a sudden drop or a sudden rise. (*d*) Respiration—a sudden increase, which is not infrequent; whether shallow or sighing. (*e*) Hiccough—sometimes a symptom of onset; more frequently late, when peritonitis is established. (*f*) Vomiting—whether with the onset of pain; it is more frequently a late feature, associated with the presence of the diffuse peritonitis.

"4. *The Blood Count.* The constant leukopenia in typhoid fever must be remembered. In a majority of instances in cases well followed there is a rise in the leucocytes, but this is not constant; they may be stationary. Also note the condition of the red blood corpuscles and the hæmoglobin. A decided drop may suggest hemorrhage.

"Sudden pain, increasing in intensity, and recurring in paroxysms, is perhaps the most constant symptom of perforation. With an increase of the pulse rate, distention of the abdomen, increasing pain on pressure, and a rise in the leucocytes, the diagnosis is rendered probable. A surgical colleague should be called early, so as to share the responsibility of the case. In a doubtful case the patient should be given the benefit of the doubt, and operation should be urged. It is surprising how well a patient, even in a desperate state, may stand it. A general anæsthetic may not be needed. In many cases cocaine has been used, with the help, sometimes, of a whiff of chloroform. One of our cases recovered after three operations in two weeks, two for perforations and one in which a perforation was suspected."

In all doubtful cases, then, it is wise to remember that a simple small incision under cocaine anæsthesia can be made with safety and will settle the question of diagnosis. This fact, urged also by Finney, is emphasized by Abbe.[1] Abbe records one successful operation in five cases of perforation. Osler is hopeful that if the perforation be recognized promptly operation may save 50 per cent.

Sequelæ of Typhoid Fever. TYPHOID SPINE. Cutler[2] reports a case of typhoid spine in a male, aged thirty-two years, who had had typhoid fever for eight weeks. Two hemorrhages occurred during the course of the disease. Also, there was a serous discharge from the right middle ear. When he left the hospital he complained of a dull ache in the left iliac bone and the lower lumbar region. He was obliged to remain in bed a good deal of the time. Three months after his discharge from the hospital he was examined, and it was found that on leaning forward from the upright position the whole spine moved as one piece, and the patient indicated the lumbar region as the seat of pain. There was slight prominence of the third, fourth, and fifth lumbar and upper sacral vertebræ, though no tenderness. Typhoid periostitis of the spine was diagnosed, and fixation by a leather jacket was employed. Two months later the patient reported himself as decidedly better.

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[1] Medical News, March 29, 1902.

[2] Boston Medical and Surgical Journal, June 26, 1902.

In the same number of the same journal Lord gives an analysis of 26 cases of typhoid spine. A few of the facts he records may be here mentioned. Twenty-two of the 26 were males. Mechanical strain is mentioned as a precipitating cause in 6. The appearance of the symptoms was usually during convalescence, in one case even three months after defervescence. Pain was usually severe, situated in the lumbar or dorsolumbar region, frequently radiating to the hips, less often to the iliocostal space, abdomen, and thighs. Remissions and exacerbations of the pain were common. There was often tenderness. Stiffness of the spinal column was mentioned in 8 cases. Swelling of the soft parts in the affected region or neighboring tissues was noted in 6 cases. Nerve root symptoms, chiefly radiating pains, occurred in nearly half the cases. The knee-jerks were variable. Symptoms of hysteria or neurasthenia were noticed in 6 cases. The temperature was normal in some cases, and in 10 it is reported as elevated. The duration of the condition was in 1 case as long as thirteen months, in some as short as fifteen days. Relapse was noted three times.

The most satisfactory treatment was rest in the horizontal position and the application of a plaster jacket, immobilizing the spine as nearly as possible, or, as a substitute, a leather jacket laced in front.

From a study of the cases Lord concludes that the pathology of the process seems to be a perispondylitis, or spondylitis, or both. A few cases may be neuroses, yet the existence of a deformity and nervous symptoms in one-half of the neurotic cases suggests that all the neurotic cases may be organic as well. In all of the 26 cases localized pain was present; local tenderness in 16; stiffness of the spinal column in 8.

These symptoms, taken together with the radiating pain in 10 cases, the disturbed knee-jerks in 8, and the association of these two in 5, with muscular spasm in other than the adjacent spinal muscles in 3, and disturbed sensation in the distribution of the spinal nerves in 5, suggest an involvement of the nerve roots in the periostitis. The frequent existence of kyphosis confirms the organic character of the lesion, seeming to indicate definite bony involvement. Rise of temperature also is against a purely neurotic theory of the disease.[1]

Two more cases of typhoid spine are reported by Moorehouse.[2] These were typical in the appearance of symptoms after the fever of typhoid had disappeared, in the paroxysmal or continuous pain in the dorsolumbar region, and in the strongly marked "nervousness." Both patients had an irregular temperature. While refraining from expressing a positive opinion as to the pathological process involved in this condition, Moorehouse says that in a certain number of the cases—he finds 21—the symptoms have been due to an inflammatory process involving one or more of the vertebræ, their periosteum, or cartilages. From the standpoint of diagnosis he calls attention to the occurrence of deformity and to the frequent association of fever with the affection. The prognosis is generally good, as was exemplified by the slow recovery of his two cases under rest in bed. Weight and extension, local applications, alteratives, sedatives, and hypnotics were also employed, though with only temporary relief. The rest in bed seems to be the most important item in the treatment.

I have seen one case of typhoid spine in an adult male, aged about fifty years. No deformity could be noticed. There were no hysterical stigmata, though the patient, weakened from a long attack of typhoid fever and suffering severe pain, was decidedly unstrung nervously. Rest in bed with symptomatic remedies was followed by a complete recovery after several weeks. The impression made upon my mind at that time, some six years ago, was that of a genuine organic·localized bone lesion.

Trichinosis and Typhoid Fever. McCrae[3] reports from Osler's clinic a case of typhoid fever with trichinosis and eosinophilia and a complicating pneumonia. The suspicion of trichinosis was aroused by the persistent eosinophilia; at one count as high as 43.8 per cent. of the leucocytes were eosinophiles. An excised piece of the gastrocnemius failed to show trichinæ, but they were found later in a bit of the biceps. McCrae, while dealing with the case largely from the hæmatological standpoint, discusses the rarity of this combination of diseases, and speaks of the difficulties of diagnosis. Certain symptoms are common to both typhoid fever and trichinosis, especially fever, general malaise, and intestinal features. But other signs usually present in typhoid may be present in trichinosis also. Rose spots have been reported several times, though apparently they do not occur in large numbers or in successive crops. The spleen has been found enlarged. The diazo-reaction has been reported as positive in about 25 per cent. of 30 cases of trichinosis. In fact, were it not for "a moderately marked Widal reaction," one might say that McCrae makes out a strong case in favor of trichinosis alone and against typhoid fever.

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[1] Boston Medical and Surgical Journal, June 26, 1902.

[2] Ibid., July 17, 1902.

[3] American Journal of the Medical Sciences, July, 1902.

Mixed Typhoid and Malarial Infection. It is, perhaps, unnecessary to add further protests against the conception of the hybrid disease—typhomalarial fever. Yet, it is interesting to get from Italy a confirmation of the view that there is no real clinical entity that should pass as typhomalarial fever, though the two diseases may exist in one and the same patient, as is well shown by a somewhat remarkable case reported by Fiocca.[1] His patient had a straight malarial fever. Three weeks later there was a run of typhoid for thirty-nine days, the characteristic temperature being uninfluenced by quinine. The Widal test was positive. Chills occurred one week after the temperature had become normal, and now æstivo-autumnal parasites were found in the blood. Quinine restored the temperature to normal, but after seven days of apyrexia there was a relapse of the typhoid, the fever lasting nine days. On the tenth day of recovery from the relapse a chill occurred, plasmodia were again found in the blood, and quinine was promptly curative.

I would call attention to the fact that the picture here drawn is plainly one of two diseases and not of a single disease. One might say there is a mingling of the two infectious processes after the manner of a physical mixture, but no true chemical combination with a resulting new product—the hypothetical typhomalarial fever. It is to be noted, also, how the malarial manifestations cropped out during the convalescence from the typhoid. This is the common time of their appearance, when there is the double typhoid and malarial infection. That the true mixed typhoid and malarial infection is quite rare is the observation of all physicians who have taken the pains to make accurate blood examinations and bacteriological diagnosis. Lyon's[2] studies confirm this statement. He found 30 cases that stood the test and could safely be regarded as examples of mixed infection.

Typhoid among Children. Hand and Walker[3] analyzed 71 cases of typhoid fever among children. They find that the Widal reaction was present in over 87 per cent. of the cases, and they believe it would have been found in a larger percentage of the cases had more frequent tests been made. The spleen was enlarged in 83 per cent.; there were rose spots in 80 per cent.; constipation was present in 42 per cent.; delirium was marked in less than 20 per cent. Intestinal hemorrhage occurred in 4 cases; nose-bleed in 3. The diazo-reaction was almost always present; 18 per cent. of the cases had complications, otitis media being the most frequent one. Among the other complications may be mentioned alveolar abscess, perirectal abscess, cervical adenitis, jaundice, pustules, vaginitis, nephritis, noma—the case ending fatally—diphtheria, also fatal; cystitis, the urine containing the typhoid germ. Relapses occurred in 8½ per cent. of the cases.

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[1] Il Policlinico, 1901, viii., 477.

[2] Johns Hopkins Hospital Reports, vol. viii. p. 263.

[3] American Journal of the Medical Sciences, June, 1902.

It is interesting to note in the treatment that was given, that whiskey was administered in almost every case, the dose ranging from thirty drops for the younger children to one or two drachms in a few cases of the older children, every few hours. Of the 71 cases 3 died—1 of noma, 1 of diphtheria, and 1 of toxæmia. The authors conclude that while in children the typhoid may sometimes run a mild or even abortive course, yet its clinical picture does not differ from that of adults in any essential feature save in a somewhat lower mortality.

Abt[1] gives a critical analysis of his experience with 200 cases of typhoid fever in children. The youngest patient was eight months old. Several were under two years, and the disease here was usually of a mild type, though severer forms were seen. The prodromata, while commonly present, were frequently quite abrupt. Headache was the rule. The older children showed the slow pulse characteristic of typhoid in adults, the younger children had a rapid pulse. In 10 per cent. relapse occurred. Meningeal symptoms were observed twice. In one case reported in detail lumbar puncture gave a clear, sterile fluid. The patient recovered, the meningeal symptoms disappearing suddenly on the seventeenth day, and the disease running an uneventful typhoid course thereafter. Labial herpes was present in 4 cases; epistaxis 16 times. In 5 cases intestinal hemorrhage occurred, though this is rare as compared to the frequency in adults. Perforation caused the death of a girl, aged five and one-half years, though operation was performed. In another girl, aged ten years, operation done by Dr. E. Wyllis Andrews, nine hours after the abdominal pain of the perforation, was successful.

The spleen was palpable in 84 cases. There were 5 cases of bronchopneumonia, 2 of lobar pneumonia. Evidence of myocardial degeneration was occasionally seen in the rapid, irregular, irritable pulse of convalescence. In all but 2 cases the Widal test was positive. The mortality was 3 per cent. One died from toxæmia and exhaustion; 1 from multiple gangrene and catarrhal cholangitis; 1 from perforation; 1 from bronchopneumonia and exhaustion; 1 from repeated intestinal hemorrhage, and 1 from severe general hemorrhages. The treatment was often without any drug whatever, at times symptomatic. Tepid baths were found of benefit, cool baths (70° to 75° F.) were badly borne.

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[1] Chicago Medical Recorder, October 15, 1902.

Griffith and Ostheimer[1] review the cases of typhoid fever reported in children under two and one-half years, adding some of their own. Their conclusion is that there is no question that typhoid fever at this age is *relatively* rare. But they deny that the disease is *actually* very rare, and their careful analysis proves, I think, the correctness of their view.

Paratyphoid Infections. Since Gaertner's discovery of the bacillus enteritidis, in 1888, increasing interest has attended the study of the intermediate members of the typhoid-colon group of bacilli. This interest has been to a large extent solely bacteriological, yet the clinical aspect has not been lost sight of, and the clinical reports are already fairly numerous of cases of paratyphoid infection. Coleman and Buxton[2] review the cases reported by other writers and add a case of their own. Their patient was a colored woman, aged twenty-eight years, whose illness was ushered in by a chill, followed by fever, anorexia, lassitude, slight diarrhœa, and tremor of the tongue. For fourteen days there was a continuously high temperature, after which with a lower temperature there were more marked oscillations until the twenty-second day, the first day of convalescence.

Splenic tumor was present, and the leucocytes numbered 10,600; rose spots, owing to the color of the patient, could not be determined. Three tests for the Widal reaction were negative. Blood examination gave a paratyphoid bacillus. The authors make a full bacteriological report, and establish the fact that their bacillus did not correspond to the typical Eberth bacillus. They also give a valuable analysis of the symptoms of paratyphoid fever, showing that the paratyphoid germs are capable of causing a general infection that has to be reckoned with in the diagnosis of typhoid fever, which disease it resembles very closely and from which it can only be differentiated by the Widal reaction or careful bacteriological examination of the blood.

By a careful study of the cases reported they find that the paratyphoid infection may be mild or severe. The symptoms of invasion may be practically the same as in typhoid. There may be headache, anorexia, lassitude, diarrhœa, epistaxis, chilliness, followed by fever, and inflammation of the upper air passages. Moreover, there may be the same typhoid state, the same depression, diarrhœa, or constipation, and rose spots, splenic tumor, and a typical typhoid temperature curve may be present. The pulse may resemble that of typhoid, and the urine may even give the diazo-reaction.

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[1] American Journal of the Medical Sciences, November, 1902.

[2] Ibid., June, 1902.

Among the complications noted have been abscess of the neck, osteomyelitis, and intestinal hemorrhage; and in one case, that of Cushing, a relapse occurred. Coleman and Buxton are inclined to regard some of the cases which are reported as irregular and atypical typhoid, as cases of paratyphoid infection, and particularly would they view with suspicion the cases of supposed typhoid in which the Widal reaction is negative. Some of the abortive typhoids, typhoids of the fourteen-day type, may perhaps belong to this class. It is well for the physician to keep in mind the possibility that the supposed typhoid is in reality a paratyphoid infection, because, while from the standpoint of present-day treatment and prognosis it may make but little difference, it is to be hoped that specific treatment will soon make it necessary that in a given case we should know positively just what germ is at fault.

In this connection I might refer to an article by Vaughan,[1] being an address delivered before the Chicago Medical Society, in which he discusses the etiology and spread of typhoid fever. During the course of this address he takes occasion to refer to the difference between the typical Eberth bacillus, the colon bacillus, and other intermediate types. He states that as a result of fourteen years' experience in the examination of samples of drinking-water he has reached the conclusion that a water containing the typical colon bacillus does not cause typhoid fever. That in many waters this germ is always found, and yet he has no evidence of typhoid fever having occurred as the result of the drinking of these waters. The more markedly a germ found in drinking-water differs from the colon bacillus and the more nearly it approaches the typhoid bacillus the more likely is typhoid fever to appear among those drinking the water containing this germ.

Vaughan does not know just where the line should be drawn between the colon and typhoid groups, and refers to these bacilli as typhoid-like bacilli, and always condemns drinking-water that contains them. He further finds that the typhoid germ as found in drinking-water is not the typical Eberth bacillus, and feels that the typhoid bacillus does not preserve its typical characteristics for any great length of time when occurring in water. The whole address of Vaughan is an interesting and instructive résumé of the facts concerning the etiology and spread of typhoid fever.

Berg and Libman[2] report an interesting case in which they believe a double infection had occurred with the typhoid bacillus and one of the paracolon group. A man, aged thirty-three years, after a week's fever, malaise, nausea, and vomiting, complained of increasingly severe pain in the epigastrium. Cholecystitis was suspected, and the abdomen was opened. From an apparently normal gall-bladder cultures were made and a growth of an organism of the paracolon group obtained. The same germ was later obtained from the blood and from the urine. Complete bacteriological details are promised for a later paper. The Widal test was at first negative, but later positive in a dilution of 1 : 200. There was leucocytosis. On post-mortem examination in the lower ileum were found "a number of completely and partially healed ulcers, with the remnants of a moderate degree of fibrinous peritonitis on the surface." From the presence of these ulcers and the Widal reaction that appeared during the course of the illness they conclude that a true typhoid infection had been present. The bacteriological examination convinced them that a paracolon organism was present also.

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[1] Chicago Medical Recorder, July, 1902.

[2] Journal of American Medical Association, June 7, 1902.

Treatment. During the past year there have been no important communications regarding the treatment of typhoid fever. Numerous articles have been written showing each man's preference for certain general lines of treatment, but in the main these articles contain nothing new. As is usual, each physician is apt to have his own special treatment. Thus we find castor-oil recommended by Bass,[1] who believes that the oil washes and cleans out the intestine, and that it is preferable to calomel.

Chloroform-water is advocated by Dibailoff.[2] He does not claim that it is a specific in typhoid fever, but believes that it is valuable in relieving pain in the abdomen and stomach, in quieting nausea and vomiting, and in alleviating thirst. The treatment by chloroform-water, it is well to remember, is not new.

Even the *diphtheria antitoxin* has been employed in the treatment of typhoid fever, and Yanze,[3] from an experience with two cases where rebellious symptoms yielded after injections of Roux's serum, speaks favorably of this as a method of treatment for typhoid.

Coffin[4] has tried the *evaporation bath* in the treatment of typhoid fever, rapid evaporation being secured by the use of electric fans. He regards this method as possessing no advantages; in fact, the mortality in a small series of cases being higher than where the ordinary Brand treatment by tubbing or the treatment by sponging has been instituted. Moreover, the baths were distasteful to the patients, and occasioned a great deal of noise in the wards because of the movement of the electric fans.

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[1] Mississippi Medical Record, April, 1902.

[2] Vratch Ebnaya Gazeta, vol. ix., No. 13.

[3] Revisto Centro Med. de Cordova, vol. ii., No. 6. Abst. Journal of American Medical Association, xxxviii., p. 1548.

[4] American Medicine, June 21, 1902.

Adrenal substance is warmly recommended by Coleman[1] in *typhoid hemorrhage.* Five-grain powders can be given every hour for a time. If nausea occurs ten grains may be given by the rectum if there is not too much diarrhœa. Coleman had excellent results in 5 cases of intestinal hemorrhage, the bleeding seeming to be checked by the administration of the drug.

PROTECTIVE INOCULATION.[2] Some of the English physicians during the South African War tried the protective inoculation against typhoid fever. Birt,[3] in the year ending September, 1901, made observations on 1210 cases of typhoid fever, and of these the uninoculated numbered 947, of which number 135, or 14.25 per cent., died. Of the inoculated 18, or 6.8 per cent., died. Birt believes and gives his figures that the average duration of the fever, the average maximum temperature, the condition of the bowels, were favorably influenced by the inoculation.

On the other hand, Crombie[4] gives statistics that would seem to indicate that the protective inoculation is of very little value. When the statistics of the South African War are complete it may perhaps be possible to draw more general conclusions than from these preliminary communications. In last year's PROGRESSIVE MEDICINE other references to this work can be found.

According to Wright[5] the statistical study of typhoid fever among the soldiers of South Africa shows a markedly smaller percentage of cases among the inoculated than among the uninoculated. The mortality figures were also decidedly in favor of those inoculated. The prophylactic inoculations are, however, somewhat risky, and the details of the procedure remain to be worked out so that it shall be entirely harmless.

A critical review of the present status of serum therapy in typhoid fever is given by Ewing.[6] Most of the work there referred to has been noticed in earlier volumes of PROGRESSIVE MEDICINE in the departments of Pathology and of Infectious Diseases. The article is, however, an excellent one for reference, including a good bibliography. And Ewing makes especially clear the difficulties that attend the preparation of such a serum, the differences between the antitoxic serum of diphtheria and that of typhoid, which must also be bactericidal, and must, perhaps, meet all the demands made by typhoid germs varying in virulence and in other characteristics. The whole subject is made more complicated by the rather uncertain relation of the colon and paracolon groups of bacilli to the typhosus. The investigations, however, should continue, Ewing concludes, in the hope that success can be secured in the treatment of typhoid fever by injections of serum and visceral extracts from animals that have been treated with a view to producing polyvalent immunizing bodies—*i. e.*, bodies that would protect against a variety of races of germs, each with special characters, which may be concerned in the disease.

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[1] Medical News, March 29, 1902.

[2] PROGRESSIVE MEDICINE, December, 1902, pp. 382, 405.

[3] British Medical Journal, January 11, 1902.

[4] Lancet, May 3, 1902.

[5] Lancet, September 6, 1902.

[6] Medical News, March 29, 1902.

The specific treatment of the disease is considered by Petruschky,[1] who, in a preliminary communication, gives favorable reports from the use of what he calls "typhoin," which consists of dead bacilli. By giving small but increasing doses he has seen such improvement as regards temperature, pulse, and mental symptoms as to convince him of the marked benefit of his plan of treatment. No benefit, or only slight benefit, was noted in cases complicated by pneumonia, tuberculosis, or otitis. Nor did the cases in which there was great heart weakness or such extensive intoxication that the body seemed incapable of reacting respond to this treatment. Furthermore, it was ineffectual in cases resembling typhoid, but not due to the true typhoid germ. The treatment, then, according to Petruschky, is efficient in the early stage of uncomplicated genuine typhoid fever, particularly before the middle of the second week of the disease. The preparation of typhoin is briefly described, and the author plans to manufacture it in quantities sufficient to enable it to be put upon the market. The details and the more accurate description of his clinical experience are to appear later in the *Zeitschrift für Hygiene und Infektionskrankheiten.*

If Petruschky's observations are confirmed it will make it all the more incumbent upon the physician in a given case to make as accurate and as early a diagnosis as possible. As in diphtheria, the success of the treatment depends upon the recognition of the disease as due to a specific germ and the use of the specific remedy before secondary or intercurrent infection have complicated the comparatively simple trouble. In fact, it may be said that in the future there will be more and more of a demand made for a definite ætiological diagnosis. It will not be enough to say that a patient has pneumonia; the bacterial cause must be recognized, so that the appropriate remedy may be employed. So in acute septicæmia, endocarditis, etc. It is earnestly to be hoped that soon a remedy will be found that will do for typhoid fever what the antitoxin has done for diphtheria. Yet, after all, it must not be lost sight of that prevention by proper sanitation is far better than cure. And in most cases preventive measures can be carried out if the physicians in a community educate their people by telling them of the common mode of origin and spread of this dread disease.

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[1] Deutsche med. Wochenschrift, March 20, 1902, p. 212.

Chantemesse[1] has succeeded in producing a serum that he regards as preventive, bactericidal, and antitoxic. While especially valuable as a prophylactic, it caused in his hands some wonderful results in cutting short the course of the disease, the temperature at times falling during the second week, as by crisis. Chantemesse does not overlook the importance of hygienic, dietetic, eliminative, and hydrotherapeutic measures even in the cases treated by his serum. His death rate in 59 cases was over 6 per cent. Of other cases not thus treated a much larger percentage died.

DIET. It is well known that there is much difference of opinion among physicians as regards the feeding of patients with typhoid. The majority undoubtedly still adhere to the liquid diet throughout the course of the disease and until the temperature has been normal for twenty-four hours or even for several days. Others allow much more freedom, believing that not only is semisolid food harmless, but that when it is well digested by the typhoid it tends to keep up his strength. In several articles and in several discussions before societies a more liberal diet for typhoids has been advocated. Brummitt[2] is one who believes that the patients do better where they are allowed such foods as bread and milk, mashed potato, custard, soft-boiled eggs, even bread and butter, rice, fowl, and some of the vegetables. Care must be exercised in giving this heavier diet, and the stools must be closely watched to see that digestion is properly performed. His experience with 98 cases convinced him that patients do better on this manner of feeding than where the liquid diet is rigidly adhered to.

The same subject is discussed by Dvoratzky,[3] who believes that with the solid food there is no great increase in temperature, no greater danger from perforation, and that the weakness and anæmia often seen during convalescence will be less marked than where patients are kept on a liquid diet.

Walls[4] makes a vigorous protest against the exclusive milk diet in typhoid on the ground that it is intolerable as a sole food for the adult in health or disease, that it is notoriously impure and contains a large amount of poisonous filth, and because in digestive tract infections it feeds the parasitic intestinal flora rather than the host. The systemic intoxication from milk poisoning is, he believes, often serious or fatal. As substitutes for milk he recommends several foods that are without the objectionable features of the milk, are more palatable, equally abundant and economic, very nutritious, easily digested, and readily assimilated. Among such articles he refers to gruels—rice, barley, oatmeal, arrow-root—meat broths, meat juice, white of egg, jellies, fruit juices, kumyss, junket, and occasionally somatose, plasmon, tropon, etc.

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[1] Presse Médicale, November 20, 1901.

[2] Australasian Medical Gazette, December, 1901.

[3] Physiol. Therapie, vol. v., No. 4.

[4] Chicago Medical Recorder, October 15, 1902.

While one may not agree with Walls in his rather sweeping denunciation of milk, and might contend that it is possible at times to obtain a reasonably pure milk; that it is nourishing even to adults; that it is not always unpalatable, etc., yet it must be admitted that he has emphasized a very important truth when he says the keynote of the dietetic management is "individualization." Each case must be as carefully considered from the standpoint of dietetics as from that of drugs. And the physician who in a routine manner prescribes milk for all his typhoids without consulting the taste of his patient, without noticing the effect of such diet on tympany, stools, temperature, etc., is far from giving his patient scientific treatment. I think, however, that few physicians give milk exclusively. Most, I believe, allow not only water in liberal amounts, but broths, soups, meat juices, tea, coffee, egg albumin, jellies.

THE DISEASES OF CHILDREN.

BY FLOYD M. CRANDALL, M.D.

THE NEWBORN INFANT.

Hemorrhages. Hemorrhages in the newborn may be either traumatic or spontaneous. Abt,[1] of Chicago, reports ten cases of the latter variety. A recent tendency has been to study these cases along bacteriological lines. Several forms of bacteria are thought to be causative factors. The character of the hemorrhage may be slow and oozing or very profuse. The use of *gelatin,* of which so much has been written, Abt holds is effective in causing coagulation of the blood. He believes it should be given by the stomach, and regards the subcutaneous methods as not free from danger. In discussing this subject Jacobi[2] said that he saw more hemorrhages in the newborn fifteen or twenty years ago than he does now; he also saw at that time much more puerperal sepsis, which he thinks has much to do with the occurrence of hemorrhage in the newborn. Another important cause is the insufficiency of blood in certain conditions of anæmia.

An interesting and important case is reported by Holt[3] in which profuse hemorrhages from the stomach ceased after the administration of *suprarenal extract,* given in doses of one grain every hour. The hemorrhages had lasted about thirty hours, and twelve doses were taken, of which ten were retained. In a hemorrhagic condition in an older boy a few months ago I saw profuse and rebellious bleeding from the nose and stomach apparently checked by the use of a suprarenal solution. While it seems doubtful whether such a solution would check a general hemorrhage, it is worthy of careful trial wherever a local effect can be obtained. Morse[4] reports a case in which suprarenal extract in dry powder failed. In referring to this case, Carr pointed out that the best results can only be obtained by the use of a solution. Such a solution may be made by dissolving the powder or by diluting adrenalin.

A case of rapid subsidence of hemorrhage is reported by Döllner[5] after the subcutaneous injection of a gelatin solution. He used a combination of 2 parts gelatin to 12 parts sodium chloride in 100 parts of water at the temperature of 100.5° F., making the injections near the inner margins of the scapula. Holtsschmidt[1] also reports favorable results from the use of gelatin in 5 cases, all of which recovered. He employed a 2 per cent. sterile warm gelatin solution, and injected into the subcutaneous tissue of the breast or leg an average dose of 15 c.cm. In the Royal Woman's Hospital of Dresden there occurred among 14,203 births 14 cases of *melæna neonatorum,* 7 of which ended fatally, thus showing that the methods of treatment in vogue, such as careful nursing and the administration of hæmostatics, were of doubtful value. He believes that there is no danger in the use of a perfectly sterile solution of gelatin. A case of melæna is reported by Joujowsky[2] as being the result of a tumor of the mesentery, with intestinal obstruction. Several cases have been recently reported as being the result of syphilitic enteritis. This is unquestionably one cause of the condition. Guthrie[3] reports a peculiar case of a brother and sister who suffered from *congenital hæmaturia.* The boy was under observation three years, and the urine was never free from blood. The child suffered from enuresis. Some benefit was derived from the treatment of the enuresis, but none from other treatment, except by suprarenal extract. The hæmaturia was a family malady. Certain articles of food or drink, such as black currants, claret, etc., could cause or intensify attacks in most of the members. In some of the patients the attacks were relatively few and far between.

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[1] Archives of Pediatrics, August, 1902.

[2] Ibid.

[3] Ibid., April, 1902.

[4] Ibid.

[5] Münchener med. Wochenschrift, May 20, 1902.

Ophthalmia Neonatorum. Howe,[4] of Buffalo, who has already written much upon this subject, again calls attention to its importance in a brief article. He quotes statistics collected by Kostaling, which show that in 17,000 births, when no prophylactic treatment had been employed, some trace of ophthalmia had developed in over 9 per cent., whereas among 24,000 children treated by the Crède method, it appeared in but one-half of 1 per cent. In private practice in which the physician knows his patient well, he may be permitted to judge of the necessity for the use of silver. We must agree with Howe, however, in believing that some measure of compulsion should be enforced to compel the proper care of the eyes in public institutions. In such places the character of many of the patients is not known, and the State is morally responsible for the well-being of the children born to them. Howe acknowledges that there are certain disadvantages in the use of the Crède method. The pain is sometimes considerable, and decided conjunctivitis is sometimes produced. His paper is written, therefore, to emphasize the advisability of further data, particularly upon the efficacy of other less severe forms of preventive treatment.

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[1] Münchener med. Wochenschrift, January 7, 1902.

[2] Roussky Arch. Path.; New York Medical Journal, March 29, 1902.

[3] Lancet, July 30, 1902.

[4] Philadelphia Medical Journal, January 18, 1902.

One of the most extended articles of the year upon the pathology and clinical course of this form of ophthalmia is that of Reynolds Wilson.[1] By far the most important step in prevention is the elimination of infective secretions. For this purpose he recommends a daily application of a solution of nitrate of silver (30 grains to the ounce) to the cervical canal and the use of astringent douches. As to the routine use of Crède's method, which consists in the instillation of a drop of a 2 per cent. solution of nitrate of silver into the eye immediately following birth, Wilson does not acquiesce in its unrestricted employment. In many cases he believes that milder treatment is efficacious. Of antiseptic drugs, boric acid is the most important. It is used in saturated solution for irrigation of the conjunctiva. Potassium permanganate is also used in the same way in solutions of 1 : 3000 to 1 : 5000. A mild solution of bichloride of mercury (1 : 6000) may be used for irrigation. Formaldehyde solution (0.5 per cent.) may be instilled into the eye during the period of beginning suppuration. (Valude.) The treatment is summarized as follows: The antepartum care of the birth canal; the scrupulous cleansing of the lids following expulsion of the head, and constantly thereafter in suspicious cases; the non-invasion of the palpebral sac by separation of the lids before the appearance of the typical discharge; prompt and absolute isolation upon the appearance of conclusive signs of specific inflammation; thorough and systematic irrigation and astringent applications of silver nitrate in cases of prolonged suppuration. As an important adjunct to local treatment, attention should be given to the general condition of the child in cases of debility and malnutrition. The measures directed toward the care of the infant are comprised in cod-liver oil inunctions, small doses of whiskey internally, and breast feeding. At the same time, the mother should receive some form of tonic treatment.

A strongly written paper by Runge[2] contradicts statements recently made by Hirsch, who reported numerous cases of ophthalmia treated by Crède's method. Runge reports 1917 cases thus treated without a single early infection. He believes that a 1 per cent. solution is as effective as a 2 per cent., and it does not produce as much irritation. Leopold[3] also insists upon the efficacy of Crède's method, but sometimes uses a 1 per cent. solution. Sevray[4] employs at the Hospital Saint-

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[1] Philadelphia Medical Journal, April 12, 1902.

[2] Berliner klin. Wochenschrift, May 19, 1902.

[3] Ibid., August 18, 1902.

[4] Gaz. Heb. de Med. et de Chir., March 9, 1902.

Antoine a 1 : 150 solution of silver. Andrade[1] reports an unusual case of ophthalmia caused by the diplobacillus of Morax and Axenfeld. This micro-organism had not been found in this disease before.

Congenital Stridor. Stridulous breathing of more or less intensity occurs in rare instances in the newborn. It may be due to malformation of the larynx, and possibly to hypertrophy of the thymus gland and to adenoids. There is, also, what may be called obstetrical laryngitis, due to the aspiration of septic matter by premature respiration during the progress of labor. Stridor from this cause is a very grave condition. The nervous origin of stridor has been suggested, but has not been certainly demonstrated. Spasm of the glottis is frequently an important factor, and in many cases, no doubt, there are several conditions concerned in causing it. A case of stridulous breathing from birth is reported by Cerf,[2] in which a satisfactory laryngoscopical examination was obtained. The free border of the epiglottis was thickened and the epiglottis was folded in upon itself. The vestibule of the larynx was a narrow slit which opened during expiration, but during inspiration the aryteno-epiglottic folds came together over it. The stridor gradually subsided, and in about a month disappeared.

Multiple Congenital Contractures. An unusual case of this character is reported by Wunch.[3] The patient at the time of the report was three-and-one-half years old. There was flexion at the right elbow, dorsal ulnar flexion of both wrists, slight flexion at the phalanges, contracture of both knees, lateral displacement of each patella, and club-feet. Such deformities are most frequent in the hands and feet, club-foot being the most frequent. The treatment in this case, as in all cases, was tendon surgery, massage, and a suitable apparatus.

Congenital Malformations. Several forms of congenital malformations of the hollow viscera have been reported during the past four or five years, and have elicited much discussion. These malformations consist of great muscular hypertrophy, for which no organic cause is discoverable. The causation of these conditions is the subject of a short but important paper by Thomson,[4] of Edinburgh. They appear under three types: 1. Congenital hypertrophy of the bladder, with dilatation of the ureters and renal pelves. 2. Congenital hypertrophy of the colon, with no organic stricture. 3. Congenital hypertrophy of the pylorus and the stomach wall. It is the last of these which has attracted most attention. These morbid conditions have several points in common: 1. In all the main abnormality consists in enormous hypertrophy of the muscular coat of a hollow organ which is known to be functionally active to some extent *in utero*. 2. The amount of hypertrophy found in cases dying soon after birth is so great it is generally admitted that it must have been present during intra-uterine life. 3. In none of these is there evidence of such permanent organic obstruction as we should expect to find giving rise to the overgrowth of muscle. 4. No other abnormalities are usually present except such as may reasonably be regarded as secondary to the muscular hypertrophy.

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[1] American Journal of the Medical Sciences, February, 1902.

[2] Archives de Médecine des Enfants, 1902, vol. iv., No. 2.

[3] Archiv f. Kinderheilkunde, June, 1902.

[4] British Medical Journal, September 6, 1902.

In considering the pathology and etiology, the causation of the muscular hypertrophy is the first point to be settled. With regard to it, there are two main hypotheses: That it is a primary developmental hyperplasia; that it is a secondary hypertrophy resulting from overexertion.

The first of these supposes that the structural precedes the functional abnormality. It is suggested that there may be a congenitally big colon or pylorus just as well as a big liver or finger; or, as Cautley says: "The hypertrophy may be due to a simple redundancy of growth. Nature, in her extreme anxiety to provide an efficient pyloric sphincter, has overexerted herself, and produced too great a quantity of muscular tissue." Thomson, however, doubts very much whether there exists in human pathology a single instance of localized true hypertrophy of muscle being certainly, or even probably, primary in character.

In considering the second theory we must remember that the cause of overwork in hollow organs is obstruction to the passage of their contents. If, therefore, there has been overwork, there must have been some cause. There is no trace of any organic cause present. Therefore, it is reasonable to suppose that there may have been a functional cause. If a functional cause has existed, it must necessarily have been of the nature of a disturbance of the normal co-ordination. For the proper working of all hollow organs perfect harmony of co-ordination is necessary, and even slight disturbance may lead to greatly exaggerated exertion. This may not be so if the inco-ordination be of a choreic or stammering variety, such as that which causes incontinence of urine or feces.

As a result of this study of 50 cases, Thomson refers to certain clinical facts which strike him as throwing light on the etiology and pathology of the disease. The first of these is the comparatively isolated character of this malformation, which tells against its being really a teratological condition. It is interesting that among these 50 cases only 6 are mentioned showing malformations of other parts of the body; and several of these were probably due to fœtal disease rather than strictly teratological origin. Ballantyne mentions the interesting point that in the large number of malformed fœtuses which he has examined he has never met with this abnormality of the pylorus. The prominence of the spasmodic element in the symptoms after birth suggests the probability of similar symptoms *in utero*. *Spasmodic contraction of the stomach* seems to be the main clinical feature in these cases. The evidence of spasm is to be found not only in the violent vomiting, but in the way in which the stomach frequently stands out, showing visible contractions and alterations in form. The fact that measured quantities of fluid often remain for two or three hours in the stomach, practically undiminished in amount, is due to spasmodic closure of the pylorus. That this closure is spasmodic is certain, because we find that the stomach, which is retaining most food for hours, will every now and then empty quite rapidly. In a few cases bilious matter has been found in the vomit. There is also evidence of relaxation from time to time of the pyloric spasm. The apparent continued growth in size of the pylorus after birth while the symptoms last suggests the probability of a similar growth in fœtal life. Still has drawn attention to the striking fact that the pylorus seems in no case to have been felt before the fourth week of life. He argues from this that the hypertrophy greatly increases during the weeks after birth. It seems probable that this is so; and, if it is proved, it will surely be in favor of the hypertrophy having been from the first a consequence of functional overaction.

The gradual disappearance of the symptoms in some cases gives reason to believe that the anatomical condition remains unchanged. These are points in favor of a functional causation. They also suggest that the disturbance is of a transitory nature. Several cases which seem to be instances of *congenital hypertrophy of the pylorus*, and which recovered without operation, have been reported, and one remarkable case has been published by Batten, in which the diagnosis was confirmed by necropsy. Dr. Batten's patient, after showing the ordinary symptoms of the disease, gradually recovered; but when he died, long after (eleven months), the usual muscular hypertrophy of the pylorus was found still present. The functional spasm which causes the symptoms is not, therefore, a necessary consequence of even great muscular hypertrophy. The hypertrophy may continue to exist without causing spasm.

Premature Infants. This subject is considered in an extended article by Ballantyne,[1] who regards it as an urgent one in Great Britain. In England the birth rate per thousand has fallen from thirty-five in 1871 to twenty-eight in 1901. The need for conserving the lives of infants is, therefore, becoming more and more urgent. The premature infant is at a disadvantage in many regards. Not only are its organs imperfectly developed and unready for independent action, but during the last three months of intra-uterine life there is a large storing up of iron, potash, and lime. This is particularly active during the last week. The premature infant has little resisting power, and is liable to thrush, dyspepsia, and diarrhœa. Its ability to maintain bodily temperature is particularly small, and it therefore requires special aid in that direction. As such an infant is virtually a fœtus, there are three leading indications in its management: to prolong the most useful and best features of fœtal life after birth; to supply some of these features which cannot be prolonged; and to strengthen the inefficient functions peculiar to postnatal life. The incubator meets the first indication, in that it prevents the great danger of hypothermy. Breast milk fed to the infant by gavage and administration of iron in the form of liquor ferri peptonatus in doses of five minims meet the second indication. Finally, the third applies especially to the strengthening of pulmonary respiration. The feeding and personal management of premature infants commonly adopted in this country were considered in considerable detail last year.[1]

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[1] British Medical Journal, May 17, 1902.

Blood Counts in the Newborn. This subject has not received much attention until recently. Some quite extended observations, however, are reported by Aiken.[2] They include 300 counts in 40 different infants. These counts show that the red corpuscles are relatively more numerous at birth than in adult life. As the child loses weight during the first few days the number of these cells increases. They then begin to diminish, and on the tenth day are less numerous than at birth. During the first few days the corpuscles vary in size and shape, and the rouleaux formation is not present. Hæmoglobin is relatively higher at birth than immediately afterward. At birth the white corpuscles are two or three times as numerous as in the adult, increasing during the first forty-eight hours of life. After the third day the number of white cells diminishes, and by the tenth day it is much less than at birth. After the first feeding leucocytosis accompanying digestion is very marked. At birth the lymphocytes exceed the neutrophiles. After the first feeding the latter increase considerably. This diminishes as the effects of digestion wear off and the blood becomes less concentrated, until in the second week the lymphocytes are again increased as at birth. The percentage of eosinophiles is greater than in adults.

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[1] PROGRESSIVE MEDICINE, March, 1902, p. 227.

[2] Journal of Obstetrics of the British Empire, April, 1902.

NUTRITION. HYGIENE.

The Relation of Children's Weight to Health. This important subject is considered in an editorial article.[1] Of late years there has come the realization that the body weight represents one of the most significant signs of the general health of the individual. Most of the large insurance companies prefer a risk on a life handicapped by serious family heredity rather than one on an individual who is twenty pounds under the average weight for his size and age. The significance of the body weight does not, of course, necessarily imply that in order to be healthy an individual must come up to any arbitrary standard, but that, with due allowances, he must not fall far below the known average weight for his height. If this is true of adults it is, if possible, even more significant in children. The weight constitutes the best index of healthy development. Subjective symptoms of the ordinary variations of feeling are retailed to the physician when the child comes down with some illness. The one record which is easiest to keep and is most significant—the body weight at regular intervals—as a rule, is utterly deficient. It must be conceded that one reason for this is that physicians generally have not appreciated the help such a record might be in furnishing data as to the child's development.

Physicians should impress upon parents the necessity of regarding failure to reach the average weight as a sign that children should not be pushed or even encouraged to do serious work, and to consider loss of weight during the years before puberty as a positive danger signal. The standard given by Hope and Browne in their recently issued *School Hygiene* forms a ready guide. A child five years of age should weigh about as many pounds as it is inches high. This is about forty. The rate of increase should be about two pounds per inch of growth, with a tendency for the proportion of weight rather to increase. Excess of weight in proportion to height is a favorable sign, while a deficiency in weight is unfavorable. For a child to be much below this standard is to subject it to the risk of every infection that may happen its way, for its resistive vitality is low. When children are growing rapidly and their height weight ratio is disturbed they should have long hours of rest, at least nine hours at night and an extra hour in the daytime, and fatiguing occupations, even games, should be interdicted for a time. Mental training may be compensated for later, but physical development never. The weight constitutes a ready and easily recognized index of how much may be allowed, so that one may not interfere with the other.

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[1] Archives of Pediatrics, May, 1902.

The comparative weight of children during the first year was studied by Bresset[1] in 258 cases. Of those fed at the breast, 65 per cent. were above the average weight. Of those fed on a mixed diet, breast, and artificial food, there was adequate increase in weight in 56 per cent. Of those fed on artificial foods alone there was such an increase in but 36 per cent. It was found that between six months and one year a mixed diet was a little better than the breast feeding alone. It would have been well if these latter cases had been observed in two groups, those between six and nine months, and those between nine and twelve months. It may be surmised that the breast feeding would have been shown to be adequate up to nine months.

The influence of climatic treatment on the physical development of children has been studied by Maccone,[2] who reports the effect upon the physical development of 72 children who were sent to the Alpine colony. The children remained in the colony, which has an altitude of between 400 and 800 metres, for two months. They were under hygienic rules, and records of weight, height, and circumference of the chest in full inspirations and expiration, muscular force, and hæmoglobin were made. He concludes that the climatic treatment has a marked and lasting influence on the physical development of children.

Sun Play-rooms. Every pediatric practitioner recognizes the importance of light and fresh air to the well-being of children, and every city practitioner recognizes the difficulty of obtaining them in large towns. It is not entirely a new idea to utilize the roofs in northern cities for this purpose. This has been done more and more extensively by hospitals and sanitaria, but scarcely at all by private families. Northrup[3] reports a successful and very practical solution of the problem in building a sun-room of glass and corrugated iron on the roof of a New York house. The idea is one which might be adopted much more generally than it is. A reference to Dr. Northrup's article will afford many valuable suggestions as to the uses of the room and its method of construction.

Mentally Defective Children. I gave extended consideration to this subject last year. Two articles of practical value have appeared since that time, one by Martin Barr,[4] of the Training School for Feeble-minded Children at Elwin, and one by Groszmann,[5] upon the treatment of defectives. Barr's article describes the different classes of defectives and outlines present methods of management. He calls particular attention to the difficulties of carrying out these methods at home, and the rarity of cure when such a plan is attempted. He also considers the subject of heredity and atavism. He calls attention to the often misunderstood fact that there is no cure for that which is not disease but defect. We cannot replace what has never been placed. We may modify and arrest what is evil, and encourage and draw out and exercise what is good, but the limit is reached sooner or later. We cannot obtain perfection in an imbecile.

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[1] L'Obstetrique, January 15, 1902.

[2] Gaz. des Mal. Infantiles, February 28, 1902.

[3] Archives of Pediatrics, January, 1902.

[4] Philadelphia Medical Journal, March 1, 1902.

[5] New York Medical Journal, February 1, 1902.

INFANT FEEDING.

As in former years, the contributions on this subject have been far more numerous than upon any other in pediatrics. It must be said, also, that the contributions presenting new facts are not numerous. Many of the articles appearing in the medical journals are in themselves excellent, but contain nothing strictly new or anything warranting particular mention in a chapter like the present one. It cannot be said that there has been any strong tendency in any particular direction. There has been a certain tendency to give more attention to the fat in the infant's food than in former years. There was a time when it might be concluded from the tone of many articles that the proteids were the only elements liable to cause trouble or worthy of particular attention. The advisability of using gruels made from cereals in the feeding of young infants has been somewhat discussed, but it is evident that the number of physicians favoring their use is larger than it was a few years ago.

The text-books, revised editions of which have appeared during the year, have had particularly thorough revision upon the whole subject of feeding, but have not made very radical departures from the methods of the past five or six years. The most radical innovation was made by Chapin in his recently published book on the *Theory and Practice of Infant Feeding.* He considers the subject in the light of biology and physiology as well as of chemistry. It seems certain that an error has been made heretofore in considering too exclusively the chemical aspects of the subject. While improvement in this direction has been made during recent years it has still held too potent a sway. Dr. Chapin's book is radically different from anything which has preceded it. It is quite impossible in the space available in this place to present a satisfactory summary. The work is too extensive, and many chapters cannot be adequately considered in contracted space. The first of the four general sections deals with the principles of nutrition, in which many biological questions are considered, some of them entirely new to the average medical practitioner. Among these is a comparison of the milk of different animals. In the section on practical feeding we find for the first time an extensive article in which neither formulæ nor complicated mathematical computations are employed. Last year I presented[1] the subject of infant feeding in a form that could be used without intricate computations or consulting text-books and formulæ. This method, upon which Chapin had already written, is elaborated in his book, and is presented in a very complete and satisfactory form. He urges the use of cow's milk with cereal diluents made up at home. The book is a decided innovation and approaches the subject of infant feeding from a standpoint hitherto neglected. It remains to be seen whether this new method will have material effect upon future writing, but the prophecy may be ventured that it will, and that the influence of the book upon future methods will be decided.

Upon the conservation of breast milk and its modification by maternal diet and hygiene, no one has written more judiciously during the past year or two than has Southworth,[2] of New York. He asserts that the rational treatment of mothers would enable many to nurse their children who do not now do so. He urges the importance of regular hours and intervals of nursing, and a liberal diet of plain nutritious food and cow's milk. The mother should abstain from tea and coffee. Regular exercise should be taken daily in the open air; driving at first, and then walking. If anæmia exists iron should be given, and also proper laxatives. The whole daily routine of the mother is to be considered, and the smallest details regulated, with the idea of making more and better milk. The mother must be willing to sacrifice social dissipations and unsuitable food for the sake of her child. She must be content to lead a placid existence, eating plain food and drinking suitable fluids.

In another article Southworth[3] refers to the value of the chemical analysis of breast milk in judging its quantity, though it is by no means imperative. The specific gravity affords a simple method of judging its quality. The improvement of the quantity and quality of breast milk is not a complicated matter if begun early enough. Faulty or deficient milk on the part of the mother is often dependent on an unsuitable diet or lack of open-air exercise. Cases of early failures of breast milk when the supply is diminished or disappears within the first week or two may often be prevented and the milk completely restored if the woman is properly managed. Bad nursing habits and faulty maternal diet are the chief causes of trouble later on. To insure the mother having a full supply of milk, plenty of fluid should be drunk during the first week of the baby's life. Throughout the period of lactation she should have plenty of good cow's milk. This should be taken every day. She should also have cornmeal gruel and plenty of water, and, for beverage, cocoa. Tea is prohibited. The balance of the diet should be plain, unstimulating, and nutritious. Beer is not beneficial, and has been found to be harmful. The same may be said with regard to malt. Constipation and anæmia must be corrected, and sleep, exercise, and fresh air provided. The importance of breast milk for the child makes it advisable to continue nursing during the greater part of the first year, either with or without the assistance of a few bottle feedings. Exclusive bottle feeding causes a larger mortality than where partial breast feedings are maintained.

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[1] PROGRESSIVE MEDICINE, March, 1902, p. 236.

[2] Medical Record, April 26, 1902.

[3] Archives of Pediatrics, August, 1902.

When artificial feeding is found to be necessary observance of the aphorisms recently promulgated by J. P. C. Griffith[1] will result largely in good to the child. These aphorisms are as follows: 1. Nature's way and nature's food are the best. 2. Do the best you can with what you have. It is a good rule to make the artificial food approach the proportionate composition of woman's milk as closely as possible. It is harmful to adopt any one fixed formula, because we cannot in any event make the mixture exactly like human milk, even if this latter had a fixed composition. The mixture must be made to suit the needs of the child. 3. Keep up with the times. The modern method of feeding is the only scientific and satisfactory one, and demands a knowledge of the percentages of the fat, sugar, and proteid, which milk contains. 4. Know what you want. It is necessary to understand why certain milk mixtures are to be preferred to others and upon what conditions in the infant a change should depend. 5. Do not be lazy. Do not accept ready-made formulæ, but study carefully the conditions of every case. The use of commercial foods is unnecessary. They do untold harm. 6. Go slowly. Avoid rapid increase in the strength of the milk, particularly at the end of the first year. The propriety of making a change in the food and the nature of this change must be determined by studying the individual child. It must not be done purely because a certain stage has been reached. 7. Starve. By this is meant a judicious temporary reduction in the amount and strength of food in various diseased states.

An extended and important article upon *milk analysis* by Wentworth[2] may be summarized as follows: The upper one-fourth of a quart of cow's milk in which the cream has risen contains 10 per cent. of fat. This Wentworth has found to be the average of a large number of milks, but there is too much variation in different cows to enable one to figure the milk modifications upon this basis accurately. (Most recent observers have placed the percentage of cream in the upper eight ounces at 13 per cent. and even 14 per cent.) This would not be of so much consequence if the percentage of fat in the cream was always low, but too much fat in modified milk is more liable to cause digestive disturbance than too little. It is advisable, therefore, to have the percentage of fat determined in the cream at least once whenever the infant begins to use modified milk, and to repeat this at the time of year when the cattle's food is changed. It is not advisable to modify the milk with cream in which the proportion of fat is under 10 per cent., because if one obtains a sufficient percentage of fat in the modification the percentage of proteids will be too high in many cases. If the percentage of fat is too low in the upper eight ounces of one quart of "set" milk it is better to take fewer ounces off the top, determine the percentage of fat in these ounces, and use such a number of ounces of cream as contains 12 per cent. or more of fat. If more proteid is required it can be obtained by the addition of the lower milk, which is almost free from fat. A safe rule would be to have at least one determination of fat made, no matter how many ounces are taken from the top of the "set" milk, and afterward to continue to take the same number of ounces off each time.

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[1] American Medicine, May 3, 1902.

[2] Boston Medical and Surgical Journal, June 26 and July 3, 1902.

Within certain limits accurate percentage modifications of milk are not essential to the well-being of a majority of the babies that are fed upon modified milk. Proof of this is afforded by the fact that so many infants do well when fed on modified milk, and yet it has been shown by the results of analysis that these modifications are rarely accurate. A complete analysis of the milk requires too much time and training to make it a practical procedure, except in special cases. The determination of the percentage of fat in the cream used for modification is easily made, requires but a few minutes to do, and enables modifications of milk to be made that are accurate enough for most cases. The advantage of modifications of milk furnished by establishments is that it is convenient, and relieves the family of all responsibility so far as the preparation of the infant's food is concerned.

Three great objections to the *commercial modifications of milk* are: Inaccurate modifications, stale milks, expense. The claim is made by those interested in the sale of commercial modifications of milk that the percentages of fat, sugar, and proteids are accurately determined in each modification. This claim of exactness forms the basis upon which such commercial modifications of milk largely depend for their success. Wentworth made twenty-six analyses, which show that little dependence can be placed upon such statements. People who reside beyond the limits of wagon delivery (and most people do for several months each year) have to use on Sunday and a part of Monday milk that is delivered on Saturday, and of necessity is milked on Friday. It is claimed that no deleterious changes take place in these milks if they are kept cold. A sufficient number of clinical observations has been made to show that such a claim is unwarranted. The cost of modifications made at home is less than twenty-five cents a day. Compare this with the cost of commercial modifications of milk, to which must be added in many cases the cost of transportation. The technique of fat, determined by the Babcock method, is simple and easily acquired. The time required for a fat determination is about fifteen minutes.

In an article upon the analysis of human milk A. V. Meigs[1] reasserts his conclusions published twenty years ago, that human milk never contains more than 1 per cent. of casein. He also expresses doubt as to the advisability of increasing the food at intervals during the first six months. He favors using the same strength mixture, but increasing its amount as the child grows older. It is unnecessary to say that this belief is not held by most pediatric practitioners. Moreover, his methods of analysis, in the light of present knowledge, are wholly inadequate.

The progressive principle in infant feeding is strongly urged by Coit.[2] By this is meant the idea of progressive advance, not only as regards the capacity of the infant for bulk, but also for increasing nutritive strength in the mixtures. This adds one more to the long list of qualifying terms as applied to methods of infant feeding, but the principle of progression is not new, for it has always been employed by most of those who have made a comprehensive study of the subject. The progressive principle is opposed to the stereotyped and fixed methods of feeding, still so prevalent among certain classes. The baby sick or well is a fixed quantity for a time being, and, therefore, the food must be the adjustable end of the combination, and as the baby advances in growth or capacity for food the same principle obtains. It is the disregard of this principle which forms one of the strongest arguments against the use of most of the proprietary foods. The progressive principle is almost completely ignored.

In an extended article upon the food factor as a cause of health and disease during childhood, Winters[3] considers the feeding of children after the weaning period. His object is to show that they should receive a diet largely of cereals and vegetables, with sparing use of flesh food. Milk contains from seven to fourteen times less iron than many other articles of food. The infant enters the world with a store of iron in the liver and elsewhere, and this store is gradually drawn upon until the digestive organs are ready to use other food than milk. Late weaning or the too prolonged use of milk as an exclusive diet for the child results in anæmia. The chemical composition of the farinaceous foods shows that oatmeal is rich in all the constituents essential for the growth and development of the child at this stage, and is especially rich in iron. Of the total nitrogenous matter 94 per cent. is in the form of proteids, and is therefore available for tissue building. It is, however, indigestible unless the cellulose is removed by cooking and straining. In the summer months it is sometimes necessary to use barley. It is seldom wise to begin the use of cereals during the warm months. A teaspoonful of oatmeal jelly may be added at first to every second bottle and later to every bottle. The fats in the yolk of egg are the same as in butter, and the richness of the yolk in fat, lime salts, phosphorus, and iron makes it a peculiarly valuable food. The child may be allowed a crust of stale bread twice a day. The effort necessary in chewing such crusts tends to develop the muscles of mastication, and facilitates the proper development of the teeth. The child may also be given stale bread broken in the food at the end of fifteen months. Its diet at this time should consist of whole milk, oatmeal or barley jelly, a soft-boiled or poached egg two or three times a week, a dry crust of bread twice a day.

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[1] Archives of Pediatrics, October, 1902.

[2] Ibid., May, 1902.

[3] Ibid., March, 1902.

In the child materials are being stored for future needs. For this reason certain constituents are required in much larger proportion by the child than by the adult; hence, the earthy salts are important in a growing child as compared with an adult. Carbohydrates are necessary in order to meet the large demands for energy, and to protect and shield from oxidation of the proteids and fats that they may be stored for future needs. Fat commands an immeasurably more exalted place in the diet of the child than in that of the adult. Seventy-seven and one-half per cent. of the heat lost from the body is lost by conduction, evaporation, and radiation from the surface. The radiating surface in the child is over three times greater than in the adult. This relatively large loss of heat makes it absolutely indispensable to have a good heat supply, and this is best obtained by an ample supply of fat in the food. If the food is deficient in fat the bony structures develop imperfectly, and rickets and anæmia supervene. An abundance of fat should be the main characteristics of the diet of the young child. Meat preparations are characterized by a large amount of nitrogenous matter. Nitrogenous matter markedly increases the metabolism of the body, not only of the nitrogenous, but the non-nitrogenous constituents as well. Of the total nitrogenous matter in meat, 15 per cent. is in the form of extractives. Meat extractives have no nutritive value; they are not tissue builders, are not oxidized in the body. They are, therefore, useless as sources of heat and energy. They are apt to overstimulate the nervous system and the metabolic processes. The proteids are of animal and vegetable origin. There is, Winters believes, no apparent difference between these two classes as to their nutritive value. In a child combustion is relatively greater than in an adult, first, because the smaller organism having the relatively greater surface carries on a relatively more rapid metabolism per unit of body weight; and second, because the metabolism is from two-and-one-half to three times greater in a growing body than in a body already formed. Overstimulation of metabolism by an excess of animal food interferes with laying on fat or muscular flesh. Carbohydrates are easily oxidized, and their oxidation serves to prevent the proteids and fats from consumption. This is a matter of the greatest importance to the growing child. Carbohydrates and fats increase the store of proteids. One of the greatest evils of a meat diet is its tendency to produce a distaste for the other foods of childhood—*i. e.*, the cereals, vegetables, and milk. The present drift of teaching is to give beef and beef-juice in considerable quantity to very young children. A consequence is to overstimulate the nervous system and tax the system with incompletely burned excretory products, and to render the urine abnormally acid. Winters believes that there is more so-called rheumatism, anæmia, valvular disease of the heart, and chorea in children at the present time as a result of a too free use of meat in the diet of the young child than from any other cause. The growing child should have an abundance of milk and cereals. Meat juice should not be given to a child before the age of two years, and then only sparingly. There should be sufficient fats and carbohydrates in the food to cover the large demand for heat and energy.

Foods rich in *carbohydrates and fat*, with a moderate proportion of meat, are those on which the most abundant and lasting deposition of fat and muscular flesh is to be assured for future and far-distant needs. Such foods are to be found in oatmeal, cornmeal, cream of wheat, hominy, rice, potato, bread, and other farinaceous substances, eggs, vegetables, and milk, with a minimum of flesh food. These food-stuffs are at the same time rich in potassium and other salts, which latter resemble those of blood, muscle, and bone, and which are essential to health.

An admirable article on the *feeding of children in the second year* is contributed by Southworth.[1] The dangers and pitfalls in the feeding of children in the second year lie at two extremes—underfeeding and overfeeding. It is well to bear in mind that an abundant food of an unsuitable type, which the child cannot digest and absorb, may at times produce the same results as underfeeding. The child may lose weight, and, in short, be starved as surely as if he received insufficient food. One of the first additions to the dietary should be well-cooked and strained gruel or jelly of one of the cereals, as oatmeal, barley, or wheat. A tendency to constipation indicates the use of oatmeal, while diarrhœa, eczema, or intestinal indigestion makes its use inadvisable. Milk or cream may be served with the cereal, and salt in preference to sugar. Boiled or steamed rice is more suitable for the mid-day meal. Cow's milk should be the basis of the child's food during the second year. It is well to increase the quantity of each feeding to twelve ounces. Soft-boiled eggs may be given; and bread, zwieback, and simple forms of crackers or biscuits, if the child has sufficient teeth. Of fruits, the orange is the first to be given, or, rather, its juice. Prunes have the advantage of cheapness and availability. A soft-baked apple, entirely freed from the skin and hard portions of the core, constitutes the last of the usual trio of fruits. Vegetables may be added by the middle of the year, and sometimes earlier if there is constipation. Spinach, carefully passed through a sieve, green peas, asparagus tips, and string beans, treated in the same way or mashed, may be given. Toward the end of the year stewed celery and boiled onions may be added. Potatoes, when given, should be baked and mealy. Meat awaits the development of the masticatory powers, but beef-juice may be given before the twelfth month, and in anæmia is an excellent hæmatonic. The finely minced white meat of poultry may also be given. Desserts scarcely enter into the question of feeding during the second year; the longer they are deferred the better for the child. Tea, coffee, and beer must be specifically forbidden among the poor, while the giving of candy and sweets is almost as much a vice among the well-to-do.

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[1] Archives of Pediatrics, May, 1902.

There has been considerable discussion during the year upon the use of *cereals in feeding* during the first year. The most accurate observations are those of F. W. White.[1] The conclusions of his study are summarized as follows: 1. Dilution of milk, with cereal decoctions of proper strength, renders the casein curd much more fine, soft, and digestible than simple dilution with water. There is no difference in the action of various cereals, such as barley, oats, rice, and wheat. 2. The above property is due mainly if not wholly to the starch in solution. The most desirable amount of starch in the milk mixture for practical use is approximately 3 to 4 per cent. 3. Diastase, by converting the starch into dextrine and maltose, promptly lessens and removes the action of cereal waters upon casein. Its addition, therefore, is not a practical measure when the action upon the curd is desired. 4. Albumin-water has no practical value as a diluent of milk. 5. Lime-water added to milk has no more effect than water upon the character of the curd produced in the animal stomach.

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[1] Journal of the Boston Society of Medical Science, 1901.

The advisability of *heating milk* which is to constitute the food of infants is still the subject of discussion. While there are still divergent views expressed, it may be fairly said that the consensus of opinion is that it is possible to produce milk so free from germs that heating is not necessary. At the same time, but little milk is actually produced so perfect in this regard that heating can be dispensed with, particularly in the warmer months. *Pasteurizing* is universally approved instead of sterilizing, and most authorities agree that it produces very slight if any deleterious change in the character of the milk. Dessau[1] believes, in fact, that pasteurized milk is more digestible than raw milk. He advises raising it to a temperature of but 140° F. Sterilizing he regards as injurious to the milk. Freeman[2] does not think that the heating of milk to 140° F. is sufficient to destroy the micro-organisms. He believes that a temperature of at least 155° F. should be employed, and that the milk should be subjected to this temperature for not less than half an hour. In his experience heating has no effect on the curding of milk. Boiled milk will coagulate in as large curds in unfavorable conditions as will raw milk. Einhorn[3] asserts that in his experience boiled milk coagulates as readily when mixed with gastric juice as raw milk. His experiments were conducted with the stomach contents of adults, but he knows that the same thing would happen if the gastric juice of infants were employed. Dilution of cow's milk causes it to coagulate in a manner much more nearly resembling the curding process of human milk. Dilution with barley water suffices for this purpose. Several years ago he made a series of observations on the contents of children's stomachs and found free hydrochloric acid was present in only two cases. Combined hydrochloric acid was present, but not the free acid. The gastric acidity in the child is, as a whole, lower than that of the adult. The albuminates of the milk, which form the almost exclusive diet of children, combine with the hydrochloric acid, and so does not exist free in the stomach. The acidity that is noticed in the vomit of children is lactic acid.

A few authorities take the extreme ground of Ranson,[4] who holds that there is no solid evidence to show that milk raised to its boiling point, which is higher than that of water, for a period of ten minutes suffers any diminution in its nutrient qualities. Monrad,[5] on the other hand, holds that sterilization is not desirable, and that raw milk is preferable when its cleanliness is assured. Gippius,[1] who has made considerable researches upon milk and its uses, and has devised a pasteurizer, emphasizes the superiority of pasteurized milk over boiled, and cites a number of authorities and personal observations to prove that pasteurized milk is the only ideal substitute for mother's milk. In boiling, the milk undergoes a series of chemical changes, which render it more difficult of digestion. His conclusions are that sterilizing should be replaced by pasteurizing in closed bottles. Observations for the purpose of determining the value of one or the other method of infant feeding are best made in private practice. Pateurized milk, he believes, may be recommended as a dietetic remedy for chronic constipation in children.

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[1] Pediatrics, February 1, 1902.

[2] Medical News, March 1, 1902.

[3] Ibid.

[4] British Medical Journal, February 22, 1902.

[5] Jahrbuch f. Kinderheilkunde, May, 1902.

Several series of investigations have been reported which seem to confirm the opinion expressed by Escherich, in 1900, that human milk contains zymases, which render it superior to any form of infant food. Spolverini[2] has found several soluble ferments in the milk of women and animals. These ferments are destroyed by heat, and he concludes, therefore, that heating is not advisable in the preparation of infants' food. Moro and Hamburger[3] found that hydrocele fluid from an infant coagulated immediately upon the addition of human milk, but did not do so when goat's or cow's milk was used. Further experiments of the same character were tried. While the explanation is not clear, it is not improbable that it is caused by a fibrin ferment which exists in human milk. Moro[4] had previously reported investigations which seemed to show that the blood serum of nursing infants possesses greater bacterial power than does that of those who are artificially fed. This, he is inclined to believe, is the result of some special ferment in the milk which they receive. Holt[5] believes that it is highly probable that there are protective substances present in breast milk.

Milk: Its Production and Use as an Infant Food. The chief drawback to the use of milk as an infant food is the readiness with which it may be contaminated. The efforts made during the past decade to obviate this drawback have been bearing abundant fruit during the past two or three years. In most large cities clean and perfectly wholesome milk can be obtained, and the general supply has been vastly improved. This improvement is due, in a very large measure, to the medical profession, for in almost every instance it has been the doctors who have been the prime movers in securing it. The measures necessary to obtain clean milk have been extensively considered in these pages during past years.[1] While but little that is new has been proposed in theoretical measures, their practical application has been so extended that the year may be considered as one showing marked progress. Milk commissions have been established in many cities. That in New York has been in existence for two years, and has been assured of success by the co-operation of the Rockefeller Research Fund, which aided its work last year to the extent of $1500. Its requirements and the various details regarding the management of dairies and the transportation of milk have recently been published.[2] A decided innovation is a school for milk dealers, which has recently been established in Brooklyn.[3] This is undertaken by Dr. Raymond, of the Health Department, because of numerous complaints from retail milkmen that the wholesalers adulterate the milk. One of his assistants will be assigned as instructor, so that they may learn to detect adulterations, and thus make specific complaints to the department.

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[1] Medicinskoie Obozrenie, 1902, vol. lvii.; Philadelphia Medical Journal, May 17, 1902.

[2] Archives de Médecine des Enfants, December, 1901.

[3] Wiener klin. Wochenschrift, January 30, 1902.

[4] Ibid., October 31, 1901.

[5] Diseases of Infancy and Childhood, second edition, 1902, p. 137.

DISEASES OF THE ALIMENTARY TRACT.

Noma.[4] An extensive but not fatal case is reported by Fischer.[5] The child was seven years old, and the attack followed scarlet fever. A 50 per cent. solution of hydrogen peroxide was used as a wash. The mouth and cheek were thoroughly cauterized with the Paquelin cautery. Cultures showed a non-pathogenic coccus, and the author believes, after considerable investigation upon this subject, that we are not in a position to state that there is a specific micro-organism. In reviewing the etiology of noma[6] he refers particularly to the recent work of Trambusti, who has described a hitherto unknown organism which he believes may be the cause of noma. It is impossible as yet, however, to form a definite judgment on the subject. It is believed that the diphtheria bacilli bears a distinct relation to many cases of noma, as proved by the beneficial effect of antitoxin injections. Even in the absence of bacteriological examination in cases of cancrum oris and of noma elsewhere, it is advisable to use injections of diphtheria antitoxin.

In an editorial article[7] discussing the bacteriology of noma the thread-like bacteria described by several observers are not definitely accepted as being specific. Particular stress is laid upon the fact of the frequent occurrence of diphtheria bacilli, which necessitates cultural search for this organism at the earliest possible moment in every instance in order that the antitoxin treatment may not be delayed. Two cases of noma complicating typhoid fever are reported by Sailer,[1] and a case of double noma complicating phthisis is reported by Laslett.[2]

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[1] PROGRESSIVE MEDICINE, March, 1901, and March, 1902.

[2] Archives of Pediatrics, August, 1902.

[3] Medical News, February 1, 1902.

[4] See PROGRESSIVE MEDICINE, March, 1902, pp. 50, 195.

[5] American Journal of the Medical Sciences, November, 1902.

[6] American Medicine, March 8, 1902.

[7] Archives of Pediatrics, April, 1902.

Riga's Disease. This is a rare disease in this country. Cases are described by Andard.[3] It occurs particularly in Italy, and is characterized by vegetations on the frænum of the tongue, which is covered by a sort of diphtheritic exudate. It is most common between the ages of nine and fifteen months. It is not considered contagious, but is thought to be due to improper methods of feeding and unsanitary surroundings. Its continuance varies from a few weeks to several months. It forms a little cauliflower mass, and is accompanied by marked salivation. The lymph nodes are usually not affected, and there are no constitutional symptoms.

Pyloric Stenosis. Four cases of this condition are described by Saunders,[4] of St. Louis. A discussion of the etiology of these cases will be found in the section on the newborn infant. Saunders gives some excellent advice as to treatment and management, of which the following is a summary: 1. The administration of some medicinal agent which shall overcome to a greater or less extent the violent contractions of the pylorus. Among the drugs to be recommended are belladonna, bromides, and chloral. Opiates should not be given, as the motor function of the stomach is thereby impaired. 2. The treatment of secondary gastric irritation. This results from the stagnation of food, and should be treated by washing out the stomach and by giving it rest. Rectal feeding should, therefore, be resorted to from time to time, and for twenty-four hours or more nothing but water should be given by the stomach. When food is again allowed the stomach should be washed out occasionally to remove a possible residuum of undigested food. 3. The diet of the child should consist of food which forms no coagulum in the stomach. This point has not been sufficiently insisted upon. Milk or any food containing undigested casein will not answer, consequently the mother's milk is usually unsuitable, while the milk of the wet-nurse in advanced lactation will succeed. Whey or peptonized milk, or a mixture of both, is generally the best food. The deficiency in fat should be supplied by cod-liver oil. A very small percentage of cream can be gradually added. If the coagulum formed by the cream causes distress or increases the vomiting it must be completely predigested.

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[1] American Journal of the Medical Sciences, January, 1902.

[2] Lancet, February 22, 1902.

[3] Rev. Mens. des Malad., vol. xx., No. 2.

[4] Archives of Pediatrics, April, 1902.

The end to be accomplished is hypertrophy of the gastric wall without dilatation, hence the quantity of food should not be large. Gaseous distention of the stomach should by all means be prevented. When it is seen that the infant is failing in spite of rational treatment, surgical intervention must be advised.

Fatty Degeneration of the Liver. Among 370 autopsies upon children, Wollstein[1] found 169 cases of fatty liver, of which 133 were ordinarily fatty, and 36 extremely so. The condition occurred most often with suppurative inflammations, next in frequency pneumonia and the intestinal diseases. It was never found in uncomplicated marasmus, and was inconstant both in syphilis and rickets. Neither of these diseases seems to cause a predisposition to fatty infiltration of the liver. In this series of cases it was the acute infections which particularly caused it.

Cirrhosis of the Liver. A case of congenital sclerosis, with obliteration of the bile-ducts, is reported by Wollstein.[2] The child lived to be two months old. The autopsy showed that the condition was a congenital defect in the common, cystic, and hepatic ducts, whereby they were reduced to impervious cords, causing a complete obstruction to the bile outflow and consequent connective tissue proliferation. Fifty-nine cases of this condition were reported not long since by Rolleston, and one has since been reported by Parker.[3] The symptoms in these cases were marked jaundice of the extremities, ascites, and petechial hemorrhages into the skin and gastro-intestinal mucous membrane. Death usually occurred before the age of four months, and invariably before the child was nine months old.

An excellent article upon acquired sclerosis of the liver in children is contributed by J. L. Morse.[4] It occurs about once in 20,000 hospital cases, and is most common between the ages of nine and twelve years. The form most common in children when not caused by syphilis is that due to obliteration of the bile-ducts. The symptoms are similar to those seen in adults. Alcohol is responsible in children for from 10 to 25 per cent. Fermentation and infection due to bacteria are more apt to cause it than in adult life. Walls[5] believes that alcohol is the cause of sclerosis in children in less than 20 per cent. of cases. Tuberculosis, sepsis, and the acute infections are all believed to be causes. As a rule, acute gastro-intestinal symptoms precede and accompany the sclerosis. Icterus is present in 70 per cent. of the cases. Ascites is present in over one-half; hemorrhages from the mouth, nose, stomach, and intestines are a frequent symptom. The prognosis is unfavorable and the course rapid, the disease terminating, as a rule, within a year, some children living only a month. Death results from toxæmia, exhaustion, hemorrhage, or a terminal inflammation of the serous organs. Therapy up to the present time has been useless. Alcoholic sclerosis was formerly very rare in childhood, but, according to Beck,[1] is becoming more frequent. Its diagnosis is difficult and its treatment very unsatisfactory.

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[1] American Journal of the Medical Sciences, May, 1902.

[2] Archives of Pediatrics, March, 1902.

[3] Lancet, March 2, 1902.

[4] Boston Medical and Surgical Journal, September 11, 1902.

[5] Pediatrics, March 15, 1902.

Cancer of the Liver. This is extremely rare, but a case in a boy, aged four years, is reported by Schlesinger.[2]

Diarrhœas of Infancy. An important preliminary report upon the etiology of summer diarrhœas of infants is made by C. W. Duval and V. H. Bassett.[3] The investigations were conducted under a grant from the Rockefeller Institute, and were made at the Wilson Sanitarium, in Baltimore. A careful study of the bacterial flora was made, and from 42 typical cases of summer diarrhœa they succeeded in isolating from the stools bacillus dysenteriæ Shiga. The septic organism was secured also from scrapings from the intestinal mucosa at autopsy, and in one case from the mesenteric glands and liver. The dysenteric bacillus was present often in large numbers in the stools of acute cases, but was secured with difficulty from cases of mild character and those of long duration on account of its presence in relatively small numbers and the antagonism of the normal intestinal bacteria. The specific bacteria isolated from different cases of the disease were identical, and agreed in morphology, cultural features, pathogenic properties, and reaction to specific serum with the dysenteric bacillus isolated from cases of acute dysentery in adults by Shiga in Japan, Flexner and Strong in the Philippines, Kruse in Germany, and lately by Vedder and Duval in this country. Agglutinative reactions were obtained when the organisms were tested (1) with the blood serum of the patients from whom they were secured; (2) with the serum from other infants suffering from summer diarrhœa; (3) with the serum from adult patients with adult dysentery; (4) with antidysenteric immune serum. The specific bacillus was not found in the stools of 25 healthy children, nor of those suffering from simple diarrhœa, marasmus, and malnutrition; nor did the blood serum of these latter individuals agglutinate the dysenteric bacillus. The authors believe their findings justify them in the conclusion that the summer diarrhœas of infants are caused by intestinal infection with the bacillus dysenteriæ Shiga, and, therefore, are etiologically identical with the acute bacillary dysentery of adults.

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[1] Jahrbuch f. Kinderheilkunde, February, 1902.

[2] Ibid., March, 1902.

[3] American Medicine, September 13, 1902.

While these investigations were very important, they must secure further confirmation before they can be unreservedly accepted.

The etiology and prophylaxis of the *summer diarrhœas* are considered in an excellent article by Heiman.[1] He regrets the common use of the term summer diarrhœa, but it has become firmly fixed, and in a certain sense expresses conditions under which it occurs. All evidence points to an inseparable relation between bacteria and summer diarrhœa. It has been the common belief that the following bacteria may be pathogenic under certain abnormal conditions: Bacillus coli communis (Escherich); bacterium lactis aërogenes (Escherich); certain staphylococci and virulent forms of streptococci (Escherich, Hirsh, and Libman); Lesage and Haymen's pathogenic micro-organism which infest the intestinal canal and causes green stools; and certain saprophytic bacteria having pathogenic properties (Flugge). Baginsky describes a pathogenic variety and a non-chromogenic, both pathogenic and causing acid diarrhœas. Booker, of Baltimore, and Tissier, of Paris, isolated many varieties of bacteria from the dejecta of infants affected with summer diarrhœa. The proteus vulgaris (Hauser) is at times virulent, but usually non-pathogenic. It is not claimed that all these organisms are ordinarily pathogenic. It is only under abnormal conditions that most of them become virulent.

The main factors in establishing a relationship between summer diarrhœas and bacterial life are predisposition brought on by a low vitality, a pre-existing catarrhal condition of the stomach or bowels, or an altered state and relaxation of the mucous membrane, brought on by the heat and humidity. Still other factors are improper feeding and bad hygienic surroundings. All these conditions lessen the bactericidal powers of the blood. That heat, and especially humidity, are largely responsible for diarrhœas in children is undoubted. As soon as atmospheric temperature reaches 75° F. and the humidity 80 per cent. diarrhœas become epidemic. By far the most frequent exciting cause of these diarrhœas is found in the feeding, either in the kind, quantity, or method employed. Micro-organisms find an entrance into the digestive tract of children most frequently through the milk, sometimes through the saliva and air. It should, therefore, be our aim to procure pure milk for artificially-fed children. A great menace both in bottle-fed and breast-fed children arises from overfeeding. Many gastro-intestinal diseases can be averted, especially during the summer months, by cutting down the daily allowance and by substituting to some extent boiled water and cereals for the proteids and fats. In speaking upon the etiology of these diseases, J. L. Morse[2] refers to them under the

[1] Archives of Pediatrics, June, 1902.

[2] Ibid.

general term—the acute enteric diseases of infancy. He would roughly divide them into three classes: 1. Those in which there is merely increased peristalsis or simple diarrhœa. 2. Those in which there are organic changes. 3. Those in which there may or may not be organic changes. The last class constitutes by far the majority of cases. It is generally believed that the cause of high infant mortality during summer lies entirely in the milk supply, but Chapin[1] presents an extended statistical study of conditions in New York during recent years which seem to show that other causes must be considered. The chief of these, Chapin believes, is dust. Dust contains great numbers of putrefactive bacteria. Theoretically we should expect to find a great deal of summer diarrhœa in localities where soil rich in decomposing matter is being turned over and dried so that it can be carried by the wind as dust, or possibly by flies. This may account for the occasional infection of breast-fed infants.

TREATMENT. As usual, a great number of articles have appeared upon this subject, but in no case do they present any ideas that are radically new. This subject was considered in detail last year, the views of nearly twenty prominent pediatric practitioners being presented.[2] Among the most satisfactory articles of the year upon treatment alone are those of Kerley,[3] and of McKee, Westcott, Harris, and Ostheimer, appearing as a symposium.[4] The present tendency in treatment may be perhaps best presented by the following outline, based upon an editorial article.[5]

After the exclusion of germs the most important phase of prophylaxis is the prevention of a predisposition to diarrhœal conditions. For this all irritant food must be avoided. Young children must not be indulged in table food. Special care must be taken with uncooked fruit, as it is often the initial factor in a severe diarrhœa. Food that has been allowed to stand in a dusty place is another extremely dangerous element. The resistive vitality of the child must be kept up to the highest pitch of efficiency. For this an abundance of fresh air, plenty of good healthy sleep, and a cool skin are essential hygienic conditions. When the weather is very warm and the child is restless the morning bath is not sufficient, but the child should be bathed a number of times during the day.

"Stop the beginnings" is the golden rule for summer diarrhœas. There is no such thing as a negligible diarrhœa in the hot weather. No excuse like teething or delicacy of health or supposed hereditary tendency to gastro-intestinal derangement must be allowed to make a distinct frequency of passages appear trivial to the mother and especially to the physician. The slightest looseness of the stools must be the signal for prophylactic measures. The child's food must at once be reduced in amount. If mere reduction in the diet does not modify the diarrhœa favorably in twelve hours, then milk must be eliminated entirely from the diet for a time. This seems a hard method of treatment to many, and especially to young mothers. Hence it is often delayed in the hope that improvement of symptoms will take place without such apparently radical proceeding. Milk is, however, a most favorable culture medium for the pathogenic bacteria of the intestinal tract. To continue its use is to feed the bacteria and not the child. As to what shall replace milk in the diet of the child there is some difference of opinion. Egg-water introduced by the French pediatrists has been very popular until the last few years. It is well known, however, that while it is not so favorable a nutrient medium for bacteria as milk, most of the ordinary micro-organisms suspected of causal activity during infantile diarrhœas will grow in it. Of late the value of cereals in preventing the multiplication of bacteria within the intestines has come to be generally recognized. They set up an acid fermentation, and acidity of the intestinal contents makes them an especially unfavorable culture medium for pathogenic bacteria. Barley gruel, or some similar preparation, makes the best substitute for milk. Whatever cereal is used must be well cooked.

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[1] Arch. of Ped., July, 1902.

[2] PROGRESSIVE MEDICINE, March, 1902, p. 245.

[3] New York Medical Journal, April 26, 1902.

[4] Philadelphia Medical Journal, July 26, 1902.

[5] Archives of Pediatrics, July, 1902.

The medicinal treatment of infantile diarrhœas of hot weather has of late years become confessedly of less and less importance. At the beginning calomel and castor oil remove irritant material that is furnishing a soil for the growth of bacteria, and so are distinctly useful. Calomel is also an efficient intestinal antiseptic. Other antiseptics, especially salol and its congeners of the coal-tar group, do no good, and are irritant to already inflamed structures. The astringent drugs must be used with great caution. They increase the irritation, tend to delay the passage of excrementitious material, and thus favor the absorption of toxins from the intestinal tract. Only the insoluble bismuth compounds, which act mechanically to pervent irritation, can be recommended with confidence. They should be given in much larger doses than is usually the custom. Opium is of service when the stools are so frequent as to be a source of great straining and progressive weakness. Except for movements at short intervals, accompanied by tenesmus, opium must not be employed. Whenever decrease in the number of movements is followed by increase of constitutional symptoms opium adds greatly to the danger of the case.

Irrigation of the colon has outlived the popularity it enjoyed a few years ago. It is never indicated except when the lower bowel is evidently the main site of the inflammatory process. The indications are foul-smelling stools containing considerable mucus. It should not be practised more than once, or at most, three times a day. Frequent large injections do more harm than good. In general, it may be said there is no specific treatment for summer diarrhœa. The secret of decreased mortality from the disease is prophylaxis and very early treatment by restriction of the diet.

Peritonitis. The association of peritonitis with empyema is not very uncommon. A case of suppurative peritonitis due to pneumococcal infection and associated with empyema is reported by Gilbert Darling.[1]

TUBERCULOUS PERITONITIS[2] is not very uncommon in children. In a paper on this subject Rotch[3] refers to the peculiar fact that laparotomy is so often curative, but asserts that the reason is not definitely known. It takes on three forms: 1. A miliary tuberculosis with ascites. 2. A fibrous form. 3. A later stage of the form just described, in which there occur tubercular deposits with caseation and softening. This has been called the ulcerative form. Five questions require consideration: The diagnosis of the presence of tuberculous peritonitis; the detection of which pathological form is present; whether the tuberculosis of the peritoneum is localized or is secondary to tuberculosis elsewhere; which of these forms is amenable to treatment, and under what circumstances laparotomy should be performed. The symptoms of the tuberculosis of the peritoneum in infancy and in early childhood are unsatisfactory and obscure. The tuberculin reaction is, therefore, of value when such reaction can be obtained, although negative evidence is not decisive. When there is a localized tuberculous process in the peritoneum, which is chronic in its course, such patients should be treated by laparotomy, which is especially indicated in the fibrous form. In the so-called ulcerative tuberculosis of the peritoneum tuberculous deposits are usually found elsewhere than in the peritoneal cavity. These cases cannot, as a rule, be benefited by laparotomy.

The diagnosis of tuberculous peritonitis is the subject of an excellent paper by Kissel.[4] He presents the following conclusions after a study of 54 cases of tuberculous peritonitis in children under thirteen years of age: It is more common in children than is generally supposed, and it can be laid down as a general rule that all classes of spontaneous ascites are really due to tuberculous peritonitis. Not infrequently the exudate in the peritoneal cavity will disappear under general tonic treatment, and the child will regain complete health. In the majority of cases the onset of the disease is imperceptible. The parents first notice that the child becomes pale and thin without apparent cause. The presence of a coincident serous pleurisy is strong confirmatory evidence in the diagnosis of tuberculous peritonitis, while thickening of the parietal peritoneum is the most valuable sign. This sign can be readily elicited before adhesions have formed by picking up a fold of the anterior abdominal wall and palpating the peritoneum between the thumb and fingers, provided the examiner is accustomed to the palpation of the normal peritoneum. In exudative tuberculous peritonitis the fluid obtained by tapping is very rich in albumin, and has a high specific gravity. In many patients who present no subjective symptoms and only moderate objective symptoms, the whole peritoneum is found covered with a thick layer of tuberculous masses.

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[1] Birmingham Medical Review, No. 280.

[2] See PROGRESSIVE MEDICINE, June, 1902, p. 29.

[3] Archives of Pediatrics, August, 1902.

[4] Archives f. klin. Chirurgie, Band lxv., Heft 2; Therapeutic Gazette, September 15, 1902.

Two very peculiar cases of *umbilical fistula* due to tuberculous peritonitis are reported by Acker,[1] of Washington.

Intussusception. A case of intussusception of unusual interest is reported by Francis Huber,[2] to which is appended some valuable comments of the surgical management of such cases by J. F. Erdmann. The patient was a boy, aged eight and one-half years. In speaking of the symptomatology Huber quotes the outline given by Edmund Owen, to which I referred last year. This outline of symptoms is as follows: 1. Sudden abdominal pain. 2. Vomiting. 3. The passage with much straining of a stool containing mucus, blood, and scanty liquid feces. 4. The presence of a tumor in the region of the ascending colon. One or more of the symptoms characteristic of the disease may be absent or may not appear until late. The urgency of the symptoms will depend upon the situation and the degree of the obstruction or strangulation. The more acute the case the more outspoken the symptoms and the greater the danger. In the subacute and chronic cases the prognosis is better and the symptoms are of a milder type. The site of the invagination will influence the picture, as the higher up the lesion the more marked are the gastric symptoms and pain. The usual variety is the ileocæcal.

Pain is a constant symptom; in fact, it has been well said: "The characteristic colic of intussusception is a diagnostic sign of the greatest importance, and it is from a recognition of its peculiar features that earlier diagnosis and earlier treatment is to be hoped." Sudden in its onset, of great intensity, and attended with screaming spells and other evidences of acute suffering, it is paroxysmal in character, with shorter or longer intervals of relief. Vomiting sets in early, and is persistent, uncontrollable, and often projectile in character. The antiperistaltic movements of the stomach are plainly evident when the abdomen is exposed for inspection. At first the contents of the stomach are rejected; sooner or later, depending on the acuteness of the case, it becomes bilious in character. Fecal vomiting is a rare event in infants.

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[1] Archives of Pediatrics, September, 1902.

[2] Ibid., July, 1902.

The character of the rectal discharge is important. At the outset one or more fecal movements are observed, followed by clear blood or bloody mucus resembling red currant jelly, the latter occurring particularly after a paroxysm of pain. This is characteristic, for, with the exception of twists and knots, no other form of obstruction is accompanied by such evacuations.

TREATMENT. Injections and operative measures are rival methods of treatment. Each plan has its advocates. Progressive surgeons, particularly in hospital practice, favor early abdominal section. As stated by Huber,[1] injections—and under the term are included inflation of the bowels with air or distention by hydrostatic pressure—have been advised; first, for the purpose of reducing the invagination; second, to lessen the size of the tumor, and thereby limit the field and so simplify the subsequent operation; third, in occasional cases the sufferings of the patient are lessened by the use of an enema prior to the operation. At present the tendency is to limit the employment of injection to the early stages—that is, not later than twelve to twenty-four hours from the onset of the symptoms. It is recognized that the longer the condition has existed the greater the danger of the pressure from within.

The surgical aspects of intussusception are discussed by Erdmann,[2] who reports 3 cases, making a total of ten operations by him in children, the mortality being 50 per cent. The fatalities were in cases of late operation, some of the patients being moribund. Dowd, of New York, also reports cases of intussusception,[3] and in an extensive illustrated article considers numerous surgical questions involved. He refers particularly to the value of the end-to-end suture, with an inner row of stitches through all the layers of the intestine, and an outer row through the outer layers.

DISEASES OF THE RESPIRATORY TRACT.

The Tonsils as Portals of Infection. The occurrence of remote diseases arising from tonsillar infection is the subject of an important article by Forchheimer.[4] That the tonsils may be the primary seat of infection, producing lesions in remote parts, has been known for some time. The paradigm is diphtheria, which has always been accepted by a certain number of authors as primarily a local infection—a fact that has been verified by bacteriological research. Erysipelas, in some instances, has been mentioned and undoubtedly does occur as primary tonsillar erysipelas. Baumgarten referred to the tonsils as a possible entrance place of tuberculosis, a fact that has been fully verified by Freidman, the latter author claiming that in young children, especially, it is the seat of the primary lesion due to food infection. Leyden, Meyer, and Singer have shown that the tonsil is first infected in articular rheumatism; and Menzer has demonstrated the presence of streptococci in the peritonsillar tissue in this disease. Menzer has also shown that the same organism has been found in the tonsil that has been excised from a case of erythema nodosum. He expresses the belief that in a large number of infectious diseases—pneumonia, scarlatina, measles—the primary infection takes place in the tonsils. The special object of Forchheimer is to call attention to the possibility of infection through the tonsils of two pathological conditions. The first of these is general infection. He believes that it is proper to conclude that if one bacterium is taken up by the tonsils others may also enter. This is accepted for diphtheria; it has been accepted for tuberculosis, and pus producers have been found. The second class of cases considered are those in which jaundice follows an infection of the tonsil. Several cases are reported by Forchheimer which he believes were due to this cause. Numerous authorities are also reported as holding a similar view.

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[1] Loc. cit.

[2] Medical Record, No. 1652.

[3] Annals of Surgery, July, 1902.

[4] Archives of Pediatrics, September, 1902.

Adenoid Growths. It is a common impression among physicians that adenoid growths do not occur in infants; but this is an error. They have been observed in rare cases in the newborn. In infancy they produce three types of symptoms—nasal, laryngeal, and pharyngeal. According to Robert Hutchinson,[1] it is necessary to differentiate them from *congenital syphilis* and congenital stridor of the larynx. Syphilis is imitated by the nasal obstruction, snuffling, and purulent discharge of adenoids. In fact, the diagnosis could hardly be made without the aid of the family history and cutaneous lesions. *Congenital stridor* appears to be a pure neurosis, and a digital exploration of the pharynx should suffice for differentiation. A case of operation for adenoids in a child eleven days old is reported by Stewart,[2] of Michigan. The child snored, and was unable to breathe and nurse at the same time. Chloroform was administered, and a Myles ring curette was passed into the nasopharynx and an adenoid mass measuring three-eighths of an inch in length and one-quarter of an inch in depth was removed. Relief of the obstructive symptoms was immediate.

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[1] Clinical Journal, 1902, No. 483.

[2] Laryngoscope, February, 1902.

According to Chappell[1] the following conditions may cause respiratory obstruction similar to that of adenoids in the nasopharynx in infants under six months: lymphatism and lithæmia, syphilitic and gonorrhœal rhinitis, congenital occlusion of the nares, digestive disturbances, congenitally high arched palate, small or occluded nostril, unusually small postnasal space, anterior projection of the bodies of the cervical vertebræ, some malformations of the soft palate, hypertrophy of the tongue.

In an extended and very scientific study of adenoid growths, with special reference to primary tuberculosis, Lartigau and Nicoll[2] demonstrated the following facts: The hyperplastic pharyngeal tonsil often contains micro-organisms, and these are mainly pyococcal forms. The bacteria, for the most part, lie near the surface. The infection usually occurs from the surface, with or without demonstrable lesion of the epithelium. Primary tuberculosis of the adenoids probably is more common than most previous studies show. Sixteen per cent. of this series contained tubercle bacilli, 10 per cent. with characteristic lesions of tuberculosis. The tubercle bacilli were present in small numbers. The lesions in primary tuberculosis of the adenoids are generally close to the epithelial surface and are local in character. The pharyngeal tonsil may be a portal of entry for the tubercle bacillus and other micro-organisms in localized or general infections.

A strong plea is made by Richardson,[3] of Fall River, for the performance of the adenoid operation upon antiseptic and surgical principles. He disapproves of the finger-nail operation as being inadequate and liable to convey infection.

Croupous Pneumonia. In the experience of Cheney,[4] of San Francisco, lobar pneumonia is not an unknown disease during the first two years of life. Its clinical appearances are considerably modified, which probably leads to its being overlooked. The onset is usually sudden, but a chill is rarely seen. A convulsion occasionally takes its place. More frequently an attack of vomiting or looseness of the bowels marks the onset. This frequently throws the physician off his guard, for the case is at first taken for one of acute indigestion. The physical signs are often slow in their development and are frequently obscure. The sudden onset, high persistent fever, infrequent, suppressed cough and localized physical signs of lobar pneumonia are in marked contrast to the course pursued by bronchopneumonia. The prognosis is almost invariably a good one, if the baby is given a fair chance for its life and does not become the object of too much professional zeal.

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[1] Laryngoscope, September, 1902.

[2] American Journal of the Medical Sciences, June, 1902.

[3] American Medicine, June 14, 1902.

[4] Ibid., July 26, 1902.

It is possible that some of Cheney's cases were of the mixed type, between lobar pneumonia and broncho-pneumonia. I recently took occasion[1] to describe this intermediate type, which often puzzles the practitioner. He will find little information regarding it in the text-books. This type represents some of the characteristics of both the other forms. It occurs chiefly during the second and third years. It is often impossible to decide, even upon post-mortem examination, to which class the case belongs, and the doubt is not always dispelled by the microscope. Holt[2] has made a special study of these mixed types and thus speaks of them: "While in typical cases the two forms are quite distinct, there are many intermediate forms which partake of the character of both, and one may be in doubt, even after a microscopic examination, into which group to place the case. It not infrequently happens that both varieties of pneumonia are present in different parts of the same lung or in opposite lungs at the same time."

During the first two years of life pneumonia is usually of the type known as broncho-pneumonia, but lobar pneumonia may occur even in the earliest months. After four years broncho-pneumonia is rare, the prevailing type being lobar pneumonia. The terms lobar pneumonia and lobular pneumonia may be misleading if they are understood to denote simply the extent of lung involved. It is always important to determine the type which is present, for in young children it is this upon which the diagnosis largely depends. Lobar pneumonia under five years is not usually fatal. It runs a definite course and, as a rule, results in complete recovery. Broncho-pneumonia, on the other hand, is frequently fatal. It runs a more prolonged and indefinite course, and frequently terminates in incomplete recovery. Signs of consolidation may often be detected for weeks or even months after the symptoms have subsided. Recurrence of consolidation in fresh areas will sometimes cause the disease to continue for weeks, rendering the prognosis always uncertain. Pneumonia secondary to other diseases is usually of the catarrhal type. It is always serious and frequently fatal.

TREATMENT. The treatment advised by Cheney[3] is simple, for the disease is a self-limiting one, and comes to an end of its own accord The main effort should be to maintain the strength until the affection runs its course. The food must be carefully and regularly administered. If the infant is nursed at the breast, let the breast continue to be used; if on the bottle, let the same food as previously given be continued at regular intervals, but diluted or peptonized if it is not well digested. For fever no antipyretic drugs should be used; cold sponging or bathing of the body is more efficacious and less depressing. For cough, if it is troublesome, or for restlessness and insomnia, Dover's powder is the most useful medicine. Frequently this is the only medicine which Cheney gives. For symptoms of prostration, such as the pulse above 150 and tendency to stupor, brandy should be given regularly in doses of ten to thirty drops every two hours, well diluted; strychnine in doses of $\frac{1}{100}$ to $\frac{1}{200}$ grain, according to age, every six to four hours, and atropine in doses of $\frac{1}{2000}$ to $\frac{1}{700}$ grain at the same intervals. Simplicity of treatment is also advised by Caillé.[1] He calls attention to the fact that we have no specific drug which will abort or control a case of lobar pneumonia. The disease is self-limited, usually ends in recovery in children, and medicine should play a minor rôle in its management.

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[1] Medical Review of Reviews, July 25, 1902.

[2] Diseases of Infancy and Childhood, second edition, p. 524.

[3] Loc. cit.

Broncho-pneumonia. Although broncho-pneumonia is one of the most common diseases of childhood, and one of the most frequent causes of death, surprisingly little has been written regarding it during the past two years. For several years its literature was very abundant. But little, however, has been added to our knowledge of the disease for several years past. McKibben[2] reports an epidemic of broncho-pneumonia. Five cases occurred in the children of one family living in very unhygienic surroundings. An infant two months old and a little girl of three years died. The other three recovered under hospital care. Throat cultures were negative for diphtheria bacilli, and the sputum contained pneumococci and pus organisms, but no tubercle bacilli.

A case of *suppurative arthritis* complicating broncho-pneumonia is reported by Bichat and Goepfert.[3] The condition is very rare. The point of departure of pneumococcus infection is not always the lung; a simple angina, a bronchitis or otitis can be at first the only external manifestation of the infection. According to certain authors, the pneumococcus does not invade the joints until its virulence is attenuated. On the other hand, the forms of arthritis complicated with infections of the serous membranes generally terminate in septicopyæmia and death. In all forms of arthritis, with or without complication, the treatment is to open wide the suppurating joints.

TREATMENT. One of the most common measures advised in the treatment of broncho-pneumonia is the mustard paste, and there is no question as to its effectiveness when properly used. Sheffield[4] advises the use of a paste or poultice consisting of the following ingredients:

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[1] Post-Graduate, July, 1902.

[2] Boston Medical and Surgical Journal, February 27, 1902.

[3] Revue Mens. des Malad. de l'Enf., August, 1902.

[4] Post-Graduate, May, 1902.

Five parts each of flaxseed-meal and camphorated oil, one to two parts of mustard, and a sufficient quantity of boiling water to make a thick paste by thorough stirring. This mass is spread on thin gauze or paper and applied snugly to the chest and back. The child is then wrapped in an oiled silk jacket, lined with absorbent cotton, and is then rolled in a blanket, which maintains the heat of the poultices. They thus require renewal but three or four times in twenty-four hours. The mustard and camphor act as mild counter-irritants, and after some time bring the blood to the surface, thus relieving the pulmonary engorgement. The skin over the chest and back does not become sodden, Sheffield asserts, as is apt to be the case when prolonged applications of ordinary flaxseed poultices are made. The form of paste which I have commonly used consists of one part mustard to six of flour, made into a paste with warm water, and of sufficient size to encircle the chest. It may be left for from five to ten minutes, and may be repeated once in two to eight hours according to the symptoms.

According to a recent editorial article,[1] the tendency of modern treatment by pediatric specialists is toward simplicity and the use of few drugs. The prevailing practice of the general practitioner is toward complexity and the use of much medicine. In the wards of well-conducted hospitals under practitioners of extensive experience one finds the chest protected by flannel or cotton jacket loosely applied, with perhaps the occasional use of a mustard paste. The desire is to embarrass as little as possible the respiration, which is always labored in pneumonia. In private practice the chest is too often loaded by a heavy poultice, the weight of which must be lifted from thirty to fifty times or more a minute by respiratory muscles already over-burdened. In the one case precaution is taken that the fever shall not be added to by a steaming poultice, excessive clothing, and an air-tight and overheated room. In the other the necessary fever of the disease is increased by the local treatment and the fears of the mother lest the child take "cold." In the one case the fact being recognized that the disease is one marked by prostration, depression, and exhaustion, the strength is conserved in every way. The child is disturbed as little as possible, and the strength is not unnecessarily wasted. Nauseating medicines are avoided, and nourishment is looked upon as of vital importance. In the other case the child is not given sufficient rest. The temperature is taken too often; something is being constantly done; doses are unnecessarily multiplied. They are frequently given with a struggle, and, if unpalatable, they disturb the stomach and diminish the already impaired appetite, and thus take away one great source of reliance—

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[1] Archives of Pediatrics, January, 1902.

adequate nourishment. Over-heating of the patient, over-giving of drugs, and too frequent disturbance are errors very commonly seen by consultants. Ammonia, ipecac, squills, and paragoric are largely given to children ill with pneumonia. Frequently several of these are combined, with licorice and syrup as a vehicle. Some of these mixtures could not be more evilly effective were it deliberately planned to destroy the appetite and impair the digestion. There is no excuse for these combinations when we know that they have so little effect over pneumonic processes.

Fever is a necessary feature of pneumonia, and unless it ranges abnormally high it need cause no alarm. In the ordinary type of the disease it is worse than futile to try to force it down by the use of coal-tar antipyretics. The child in too many cases becomes cyanotic, with embarrassed circulation and respiration. The repeated administration of smaller doses results in increasing the depression natural to the disease. If the practitioner wedded to these ancient methods of treatment could realize how much better results he would obtain, and how much more comfortable his little patients would be with less heroic and complex treatment, he would at once abandon it and adopt more rational methods.

Pleurisy. S. W. Kelley[1] describes what he believes to be a new sign of pleuritic effusion. In the course of the symptoms which indicate the early stage of pleurisy, among which is the attitude of lying on one side or bending toward one side, the position changes and the patient instinctively turns and prefers to lie upon the back or to be propped up high in bed and avoids bending toward that side or pressing upon it. This is a sign of effeusion—probably an effusion of considerable bulk and poured out with rapidity. This Kelley has observed repeatedly, though he does not assert that it is constant in its appearance and infallible in its significance. He quotes Osler who says: "When the effusion is large the patient usually prefers to lie on the affected side." This, according to Kelley, is the fact only when the effusion is of long duration. He offers as an explanation the supposition that lying upon the back or sitting up causes the least pressure of the effusion against the compressed lung and the heart and great vessels, and allows the greatest freedom of breathing and circulation. If the child lies upon the affected side, the weight of the body upon the chest wall presses the fluid still more upon the compressed lung, and instinctively the child changes to an easier position. To lie upon the sound side would interfere with the respiratory movements of the sound lung. This leads the patient to involuntarily avoid that position. But to lie upon the back takes the pressure off the more yielding ribs and allows the most freedom of respiratory movement and the least displacement or pressure upon the blood organs.

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[1] Archives of Pediatrics, October, 1902.

Empyema. The literature of empyema has not been as extensive during the past year as for several years previous. One of the most exhaustive discussions was that before the New York County Medical Society. At that meeting a paper was read by Koplik,[1] in which he referred to the uncertainty and vagueness of the symptoms, and asserted that a positive diagnosis cannot be made without exploratory puncture. At the same meeting an admirable paper on treatment[2] was read by C. N. Dowd. It was based upon 73 operations, 61 being personal cases of the author. For simple cases of empyema the following method was used: Excision of about one and one-half inches of the seventh or eighth rib in the posterior axillary line; light ether anæsthesia is usually employed; the purulent coagula are removed; short rubber tubing, cut partly across, doubled, and held by large safety-pins, is used for drainage; abundant gauze dressing is applied and changed when saturated. If the patient's condition contraindicates general anæsthesia, an incision into the chest may be made between two ribs under cocaine anæsthesia. Aspiration is only used to give temporary relief in patients who are in great distress from pressure of the fluid, or temporarily to relieve the second side of a double empyema after the first side has been opened. The patients are allowed out of bed as soon as is practicable, and the expansion of the lung is encouraged by forced expiration. Irrigation is only used when there is a foul-smelling discharge from necrotic lung tissue. Secondary operations are not done until good opportunity has been given for healing. Usually three or four months should have elapsed after the primary operation, and there should have been no noticeable improvement for about a month. In the secondary operation the expansion of the lung should be encouraged by incising, stripping back, and, if necessary, removing portions of the thickened pulmonary pleura. The examination of 44 of the patients at long periods after operation indicates that recovery is usually complete in the simple cases, and that there is surprisingly little deformity in most of the severe cases.

A remarkable case is reported by Holt,[3] in which a double sacculated empyema was accompanied by a high temperature, which continued unabated for three months.

Asthma. The most satisfactory treatment for asthma in children, according to Méry,[4] is inhalation of pyridin in seven or eight-drop doses. It may be inhaled from a handkerchief or saucer four or five times a day. If pulmonary congestion is present the use of counter-irritants, dry cups and hot compresses upon the chest, or even hot baths are recommended. Bronchial catarrh should be treated by terpine hydrate or potassium iodide.

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[1] Medical News, September 13, 1902.

[2] Ibid.

[3] Archives of Pediatrics, January, 1902.

[4] Gazette des Mal. Infantiles, February 13, 1902.

Gangrene of the Lung. According to Carr,[1] gangrene of the lung is very infrequent in children. From the description of Rilliet and Barthez, in 1843, to the present there has been no absolute symptom or set of symptoms that discloses the destructive character of the disease or separates its features from many that are common to septic pneumonia, empyema, and bronchiectasis. When the gangrene of the lung is observed in the course of a disease like measles the symptomatology is so complex that the gangrenous invasion is masked. The physical signs are not always distinctive of consolidation, and when a pneumonic area is present a focus of gangrene which has undergone softening will produce sounds similar to those of a tuberculous process. Infarcts near the site of destructive necrosis may cause sufficient consolidation to disguise the character of the gangrene softening. Pneumonia and gangrene are usually associated, and the separation of the physical signs due to the latter process is not always easy. As the gangrene is a destruction of lung tissue, some help may be gained by an inspection of the sputa, which are blood streaked, rusty, greenish, and frothy in children whose ages would indicate that they could not expectorate except by violent effort or after a great accumulation of material in the upper air passages. Unfortunately, however, the expectoration is frequently wanting, as are the gangrenous odor and sweetish breath, which are described as distinctive when detected in older patients. The septic picture is a dark one, and perhaps is at best stated that the constitutional symptoms are out of all proportion to the physical signs. The bacteriology is not fully established, but Seitz found that any one of the pyogenic group of bacteria may be present in the gangrenous areas. When a diagnosis can be made the success of treatment is not in medication, but from surgical interference. Over 60 per cent. of a series of cases recorded by Herczel were saved by radical measures. A case of gangrene in a child one year old is reported by Carr, and extensive references to the literature are given. Three cases are also reported by Francis Huber.[2] They were all fatal.

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[1] Archives of Pediatrics, March, 1902.

[2] Ibid.

DISEASES OF THE CIRCULATORY SYSTEM.

The Heart of the Child. In an excellent article on this subject, Lees[1] quotes Sturgis, who says that "the child's heart holds as many secrets as the man's, and is even more deceiving." As disease of the child's heart not only hinders its future work, but also impedes its development and the development of the whole organism, its integrity is even more important than that of the man's. In examination of the child's heart murmurs due to congenital malformations must be borne in mind. They are systolic in time. A presystolic or diastolic congenital murmur is exceedingly rare. A low, soft systolic murmur over the tricuspid region, best heard about half-way between the left edge of the sternum and the nipple line, is not very uncommon in very young children, and does not indicate any organic disease. The left border of cardiac dulness is distinctly internal to the nipple line. The cardiac muscle of the child is especially susceptible to the deleterious influence of toxins and poisonous products circulating in the blood. Diphtheria, influenza, pneumonia, typhoid fever, and tuberculosis may all cause enlargement of the left ventricle.

Diseases of the Heart in Children. The well-known fact is referred to by Sansom[2] that we have to do with a rheumatic heart in the great proportion of cardiac affections in children. Even in malformation of the heart there is not infrequently added to it a form of disease essentially of a rheumatic nature. Further, a seemingly congenital malformation of the heart may be due to intra-uterine endocarditis. The groups, varieties, and phases of the rheumatic heart in children considered by the author are: The temporarily swollen or enlarged heart of rheumatism; the heart of rheumatic pericarditis; the heart of rheumatic endocarditis, with resulting valvular disease, and the heart of slow, insidious endocarditis, with resulting valvular disease inducing mitral stenosis. Although rheumatism is a mild and often painless disease in children, the heart phenomena are prominent and very frequent. The cause of the temporary enlargement of the heart so common in child rheumatism the author holds to be due to something which enfeebles the heart, but which is not of the nature of the oridnary inflammatory trouble or degeneration; it is an infiltration which cripples the heart.

Cardiac Dilatation. The frequency with which cardiac dilatation occurs in childhood is pointed out by Eustace Smith.[3] It may occur without valvular lesions, and is due to blood pressure in a flabby, ill-nourished, or degenerated heart, and may occur without there being any special bar to the passage of blood from the organ. Anæmic, weakly boys, who overtax their strength in violent games, often show an appreciable degree of cardiac dilatation. In children of both sexes rapid growth alone, if joined with coldness of the extremities and poor blood, will cause the same condition. So, also, in broncho-pneumonia, when the superficial veins are noticed to be turbid and prominent, signs of dilatation of the right ventricle may often be discovered. Other diseases in which cardiac dilatation is apt to occur are infectious fevers and allied septic states. In diphtheria, especially, rapid and extreme dilatation may give rise to very serious apprehensions. The complication is also common to acute rheumatism and influenza, and introduces into each of these diseases an added element of danger.

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[1] Lancet, February 1, 1902.

[2] Ibid., August 23, 1902.

[3] Practitioner, January, 1902.

The Prevention and Treatment of Heart Disease. As rheumatism is the cause of so much of the heart disease seen not only during childhood but also in adult life, its prevention is the chief means at our command for preventing heart disease. Impressed with the importance of this subject,[1] I recently wrote a paper upon the management of rheumatic children. As rheumatism is itself so mild, the chief reason for giving it attention is the prevention of its cardiac complications In the great majority of cases, therefore, the prevention of heart disease consists in the prevention of rheumatism. If that disease does occur it should be treated with the idea largely of preventing cardiac involvement. Children suffering from any rheumatic manifestation, even chorea, if it be severe, should be put to bed and kept there absolutely until every symptom has disappeared. I feel like speaking very strongly upon this point, for it is one upon which the average practitioner frequently errs. It will not always prevent cardiac involvement, but will do more to that end than will any other means that we possess. We cannot always prevent cardiac disease in our young patients of rheumatic tendency. By proper diet, clothing, exercise, hygienic management, and perhaps in some cases by medication, we may do much to prevent attacks of rheumatism. Such an attack having occurred, we may still, by diet, rest in bed, protection from exposure, and medicinal treatment, do much to prevent cardiac involvement. The attack having been controlled, we may lessen the danger of relapse by continuing all the precautions, improving the nutrition, and persisting in the medication. The vital importance of nutrition-improving treatment cannot be too strongly insisted upon, as well as the folly of relying wholly on specific medication in the rheumatism of children.

The importance of rest in some cases of diphtheria is also very great.

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[1] Archives of Pediatrics, August, 1902.

Absolute quiet and the most careful regulation of the diet to avoid distention of the stomach is essentially to avoid danger. Eustace Smith[1] insists upon the importance of quiet not only in the case of diphtheria, but in every acute disease where the dilatation is rapid. A recumbent position should be enforced, and on no pretence should the patient be allowed to lift even his head from the pillow. The diet should be regulated so that those foods which tend to ferment and fill the stomach with wind should be forbidden. Baked apples, grapes, oranges, and acid fruits are to be avoided. The patient should be fed with milk, custards, strong soups, yolk of egg, and rusk. The drugs should be used which are indicated for the disease which the heart disorder complicates. In rheumatism it is well to combine the salicylate of soda with five or ten grains of ammonia citrate of iron to counteract the lowering effect of the soda salt. Iron, indeed, with strychnine should be our great resource. But to show its full value the strychnine should be pushed as far as the patient can bear it, and in this condition children bear it very well. The moderate dilatation which occurs in anæmic children requires no special precautions beyond forbidding for the time violent exercise and the more boisterous games. It quickly subsides when measures are taken to improve digestion and restore the general health.

DISEASES OF THE URINARY SYSTEM.

Urinalysis in Children. This is a subject much neglected by practitioners. Many of the peculiarities of the urine in infants are considered in an excellent article by J. M. Taylor.[2] In writing upon the same subject[3] I referred to the fact that the character of the urine in infancy must be fully understood lest erroneous conclusions be drawn. After the third day the specific gravity is very low, ranging on the fourth or fifth day from 1003 to 1007. During the first six months it is rarely over 1010; before the beginning of the fourth year it is not often found above 1014. After ten it may be found as high as 1020, but it is more commonly about 1015 until the fifteenth year. After the first days of life, when the urine is apt to be scanty and high colored, it is commonly pale or colorless. It is frequently turbid from mucus. The reaction during infancy and childhood is commonly faintly acid, but it may be neutral or faintly alkaline, without being abnormal. A sample may usually be obtained without great difficulty. If a child be placed over a small chamber every fifteen minutes for an hour or so sufficient urine can usually be secured. The result may be rendered more certain if a sponge or cloth wet with cool water be placed over the pubic region. A clean sponge or some absorbent cotton may be placed under the napkin so as to catch the flow, and sufficient may sometimes be thus obtained.

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[1] Loc. cit.

[2] International Medical Magazine, May 2, 1902.

[3] Ibid.

The brick-dust deposits of newborn infants and young children consist of uric acid. The condition is quite different from the ordinary form of lithuria of later infancy and childhood with its sediment of urates. This urine is usually sharply acid, of comparatively high specific gravity, and sometimes very irritating. It is best relieved by giving freely of water, an alkaline water being particularly helpful, and by reducing the sugar and starches in the food.

Albumin is frequently found during the first days of life, its presence being at this time of little significance. After the first week its presence is usually of the same significance as during later life. The chief exception to the rule is the so-called cyclic or functional albuminuria, which is occasionally seen in children between five and fifteen years. It is impossible in this place to enter into a description of its symptoms or its causation. It is sufficient to say that a diagnosis of functional albuminuria should not be made until the patient has been under observation for some time and the possibility of organic disease of the kidney has been with certainty eliminated. It is also to be remembered that hyaline casts may frequently be found in the urine of perfectly healthy infants during the first week. Granular casts are also found, but are less common than the hyaline. It is thus evident that during the first week or ten days of life urinary analysis may prove very misleading if judged by the adult standard.

Sugar is sometimes found in the urine of healthy infants during the first three or four weeks. It may be found also in the urine of older infants, particularly during the second and third months. It is as apt to occur in those breast-fed as in the artificially fed. Its appearance in most cases is accompanied by symptoms of impaired digestion. In these cases the sugar may sometimes be detected by Fehling's test when it cannot be found by the fermentation test. It is without doubt milk sugar. Koplik has found the same condition in adults fed largely upon a diet of infant foods. The diagnosis of functional glycosuria should not be made too quickly, for diabetes may occur very early in life. Blood in the urine of infants is probably always pathologic. In addition to the causes which may account for the appearance of the condition in later life are melæna, purpura, scurvy, and new-growths of the kidney. Pus in the urine of young children may have its source in any portion of the urinary tract, but it is more frequently derived from the pelvis of the kidney than from any other locality. Acute pyelitis and pyonephrosis are not uncommon in infants. Chronic pyuria is commonly due to a calculus or to tuberculosis of the kidney.

The methods employed in urinary analysis in children do not differ from those in ordinary use for older patients. The small amount of the specimen frequently available renders the use of very small instruments desirable. A small test tube gives as accurate results as does a large one. A very small urinometer is a convenience. I sometimes employ for this purpose the lactometer which accompanies Holt's milk-testing apparatus. It requires but a tablespoonful of fluid, and is as accurate as one requiring several ounces.

Nephritis. It is often asserted that nephritis is a frequent complication of gastro-intestinal disease in infancy, but Carr[1] asserts that but comparatively few pathological and clinical observations have been made which bear out that statement. The largest number are Kjellberg's, who found nephritis sixty-seven times among 143 fatal cases of acute and chronic enteritis. Czerny and Moser describe nephritis as present in 11 infants who died of gastro-enteric disease. Holt found only 1 case of nephritis among 70 autopsies, and maintains that marked cloudy swelling of the tubular epithelium is common in enterocolitis, but no more so than is the case in any febrile disease. The latest investigation by Morse fully confirms this observation. Morse's cases showed albuminuria frequently, but it was rarely marked in degree. Degenerated epithelial cells were numerous, and hyaline and granular casts were accounted for by the dehydration caused by the diarrhœa and by the diminished ingestion of fluids. There was no relation between the albuminuria and the symptoms presented by the child. The conclusion seems justified, from our present knowledge of the subject, that the kidney lesions which occur in the course of acute diarrhœa in infancy are degenerative in type and but very rarely inflammatory. They are probably present in the majority of cases, and are due to the action of the toxins of the bacteria, which are the etiological factors in the production of the primary disease. More frequent routine examinations of the urine in infants are decidedly to be recommended, especially from those suffering from intestinal diseases.

Several articles have recently appeared upon the subject of influenzal nephritis in childhood. Ratchford[2] reports 4 such cases, and is inclined to believe that they are not uncommon. He considers *acute influenzal nephritis* in childhood not as a sequel or complication, but as a part of the influenzal attack. The kidneys are among the organs of the body which are not exempt from primary attack by the influenzal poison. Of these reported cases 1 died and 3 recovered. The nephritis was very marked, being hemorrhagic in 2 cases. An extensive paper on the same subject is also contributed by Miller,[1] of Philadelphia, in which he presents an analysis of 40 cases, mostly collected from the literature. From this study one would seem warranted in saying that nephritis is a rare complication in influenza in young adults and children. In infancy it is almost unknown. Albuminuria is more common, and is probably present in all severe cases. *Hæmaturia* alone is not infrequent, and, like nephritis, is seen oftenest in early life. The sexes are affected equally. The nephritis may appear early in the influenza, or at varying periods after the acute symptoms have subsided. It is usually an early complication, occurring in one-half the cases within eight, and in two-thirds of the cases within twenty-one days of the commencement of the influenza. The clinical type varies ; it may be that of an ordinary acute nephritis, but in the majority of the cases is of the hemorrhagic type, this form being especially frequent in young adults and children. Œdema is absent in more than one-half of the cases, and is apt to be slight. The onset is usually attended with fever. The nephritis is of short duration, generally lasting less than three weeks. The prognosis is good, recovery being the rule, although a small number of cases pass into the chronic subacute stage. When influenza attacks those whose kidneys are already diseased it is apt to be serious and fatal. From the meagre pathological reports the lesions appear to be those of an infectious or toxic nephritis, often taking the form of a glomerulo-nephritis.

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[1] Archives of Pediatrics, August, 1902.

[2] Medical News, March 15, 1902.

A case of *contracted granular kidney* in a boy, aged seven years, is reported by Milligan.[2] The chief symptoms were pallor, wasting, headache, and polyuria. The heart was slightly hypertrophied, the skin bronzed, and the urine of low specific gravity and albuminous. Later he developed albuminuric retinitis and epistaxis, and cutaneous hemorrhages occurred. Four weeks before death the heart began to fail, the extremities became dropsical, giving place to general anasarca with anuria, and the child died comatose. The kidneys, microscopically and macroscopically, were typical of the condition.

The operation of renal decapsulation (Edebohls' operation) for chronic parenchymatous nephritis in a child of five years is reported by Caille.[3] The result was sufficiently satisfactory to render Caille willing to adopt the operation in future suitable cases.

Pyelitis. In an excellent article upon this subject, Thomson,[4] of Edinburgh, reports observations made upon eight cases that occurred in his own practice. While it is not common he does not believe it a very rare disease, if one may judge from the number of cases reported during the past few years. All of these eight cases recovered under proper treatment. The disease usually improves with striking rapidity so far as the temperature and subjective symptoms are concerned. Several weeks, however, usually pass before the pus disappears from the urine. The bacteria usually remain much longer, but they seem to have lost their pathogenic properties to a large extent, and neither cause suppuration nor subjective phenomena. The main and only essential treatment consists in rendering the urine neutral by administering alkaline remedies as speedily as possible, and keeping it so until all the symptoms have disappeared. When this indication is thoroughly carried out its good results are very remarkable. The pain and uneasiness vanish, and the temperature rapidly falls and remains below normal. After the pus has ceased to be present we find that with ordinary tonic measures the urinary tract seems able to defend itself. The organisms cease to cause trouble, and in time they also disappear. The alkali which Thomson has always used has been citrate of potash, and it has to be given freely until the urine loses its acidity. In less severe cases twenty-four grains a day may suffice for this purpose, but it is best to begin with thirty-six to forty-eight grains. Although this amount is extremely beneficial to the local condition and rapidly allays both pain and fever, it exerts a depressing action on the general system. The child's temperature becomes subnormal, and it seems flabby and nauseated, not infrequently vomits, and may have diarrhœa. No harm, however, follows this temporary depression, and the medicine should be steadily persevered with. Sedatives are unnecessary, owing to the rapid relief afforded by the potash. It is important that the child should be encouraged to drink as much fluid as possible. The main conclusions of this paper may be stated as follows: In infant girls when debilitated from any cause acute pyelitis may be set up by the emigration of the bacilli coli from the bowel. The presence of the disease is sufficient to set up high fever, extreme distress, and a copious deposit of pus and bacteria in acid urine. Unlike any other disease except malaria, it frequently causes rigors, even in young babies. The presence of anal excoriations has possibly an important etiological significance. The prognosis is altogether favorable, although complete recovery is sometimes delayed for weeks. The only essential treatment consists in the thorough and long-continued neutralization of the acid in the urine by the administration of alkaline remedies.

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[1] Archives of Pediatrics, January, 1902.

[2] Ibid., March, 1902.

[3] Ibid., October, 1902.

Scottish Medical Journal, July, 1902.

Sarcoma of the Kidney. Two successful cases of nephrectomy for sarcoma of the kidney in children are reported by Le Conte.[1] The paper is devoted chiefly to the question of the advisability of operating in the presence of this very fatal condition. After a study of operation cases reported since aseptic technique has been made more perfect, Le Conte concludes that with modern methods the immediate mortality of the operation should be reduced to 15 per cent. or even a little lower; that operation prolongs the average duration of life; that the percentage of cases that will go three years or more without a sign of recurrence (the so-called cures) will be very greatly increased if the physician can make an early diagnosis and be assured of the fact that an immediate operation is proper and justifiable.

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[1] Therapeutic Gazette, September 15, 1902.

DISEASES OF THE NERVOUS SYSTEM.

Chorea. A review of the embolic theory is given by H. Thomas,[1] who reports a case of chorea showing atrophy of the left optic nerve. According to his investigations only six other cases of embolism of the central retinal artery were found in literature. All were considered by the author as dependent upon the emboli and supporting the theory of the embolic origin of chorea. The objections to this theory seem so strong in the light of our present knowledge that it appears untenable. While it seems but of small value at the present time to advance any theory as to the seat of the morbid process of chorea, Thomas thinks that when the lesion is found it will be on the afferent rather than on the efferent side of the motor mechanism.

In an editorial review on the etiology of chorea[2] it is asserted that there is much evidence at hand to point to a necessary vulnerability of the central nervous system, particularly the motor cortex of the brain, transmitted by heredity. There seems to be an inherent irritability of the upper motor neurons which psychic or physical trauma can excite to precipitate the typical symptoms. But there is more than this vague pathogenesis to clear up in many of the cases studied clinically; much to lead up to toxic etiology of this predisposition in cases where a neuropathic heredity or shock do not exist as causative factors. Thus, extreme anæmia, remote rheumatic and other diatheses, gastro-intestinal catarrh, the infectious diseases of childhood, all seem to act as both predisposing and exciting causes in a minority of cases of acute chorea.

The pathology of chorea has not often been studied, for autopsies are rare. Reichardt[3] asserts that he found an inflammation characterized by perivenous, round-cell infiltration, involving almost the entire brain, and only in one place assuming macroscopic proportions. The seat of the most marked change was the Sylvian aqueduct and the visual ganglia in one case, and in another the subcortical layers. The bacteriological examination was negative in one case, and doubtful in another where the staphylococcus aureus was found in the blood, but an endocarditis also existed. The chorea bodies and multiple emboli which have been described as characteristic of chorea were not found, which seems to strengthen the view that chorea is due to the toxins of bacteria.

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[1] Johns Hopkins Hospital Bulletin, vol. xii., No. 127.

[2] American Medicine, April 19, 1902.

[3] Deutsche Archives f. klin. Med., vol. lxxii., Nos. 5 and 6; Medical News, August, 30, 1902.

TREATMENT. Russell[1] refers to the importance of rest in bed and isolation. It is doubtful, however, whether such treatment is of very great value in slight cases unless it be from the point of view of the moral effect. He expresses his belief in the sedative effect of hot baths and hot packs. Though having no experience in regulated exercise in the later stages of chorea, he is inclined to think that good results might be obtained as long as they produce no increase, either immediate or subsequent, in the movements. As to drugs, arsenic and antipyrine are still apparently regarded as the most reliable. Turner[2] especially advocates the use of large doses of Fowler's solution. To a boy, aged nine years, he gave twelve minims three times a day as an initial dose, but reduced it to five minims as soon as physiological symptoms appeared. Comby[3] believes only in antipyrine and arsenic, which he gives in full doses. He keeps the patient strictly in bed on a diet of milk, and highly commends hydropathic treatment. He uses cold effusions or warm baths. He frequently wraps a patient in a wet sheet for half an hour or more two or three times a day. Jemma[4] recommends lumbar puncture. In one case in which he used it relief was immediate. The symptoms gradually returned, and the puncture was done the second time. Arsenic, however, was pushed, and a rapid recovery followed. In a second case recovery followed promptly upon the first puncture.

Arsenic has held its position as a useful if not the most useful agent in the treatment of chorea. It must usually be given in full doses, but it should not be forgotten that the enormous doses sometimes advocated are capable of causing multiple neuritis of a stubborn type.

Night-terrors. Views as to the causation of this condition are extremely variable. There are differences of opinion, in fact, as to the actual nature of the disease. Some consider the attacks as symptoms of other diseases, while others believe that they form an entity—an idiopathic affection of the brain. There are still others who maintain that there are two forms of night-terrors, primary and secondary. These various opinions were considered in detail two years ago.[1] Rey, whose opinion was quoted last year, maintains that the condition is always the result of obstruction to respiration. He asserts that the symptoms are simply the result of slow and prolonged carbonic poisoning. Many recent authorities are inclined to adopt this view. It is certainly a fact that children with adenoid growths are particularly liable to suffer from night-terrors. Nothing has recently been added, however, to render the subject more certain.

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[1] Treatment, April, 1902.

[2] British Medical Journal, February 21, 1902.

[3] Bulletin de la Soc. Méd. des Hôp., 1902.

[4] British Medical Journal, January 25, 1902.

Salaam Spasm. An excellent description of this peculiar condition is given by Simon.[2] Its cause is very obscure, but it always occurs before the twentieth month. It consists of oscillations of the head, usually antero-posterior, with occasional slight lateral inclination. They are regular and rapid, and cease during sleep. There is also rapid bilateral nystagmus. Simon distinguishes two types. In the first of these the spasm disappears and epilepsy supervenes. The spasm thus seems to be a form of petit mal, and is prone to appear in isolated attacks. In the second the spasm is continuous during the waking hours, and there are no mental symptoms, neither is there hereditary taint. Recovery occurs in from two to four months. Rickets and the absence of light are believed to be among the causes.

Tetany. Under this name is included several conditions whose true nature is somewhat doubtful. Numerous cases are every year reported as tetany which are probably mild tetanus. Tetanus in children is frequently mild, and is fairly amenable to treatment. A case is reported by McAllister[3] which, though it has some elements of doubt, was probably tetany. In discussing this case Griffith,[4] who has studied the disease extensively, asserted that there are two distinct forms of tetany—the continuous and the intermittent—which shade into each other, and may even be present in the same case. The intermittent form is very much less frequent in children, and the continuous type is very unusual in the adult. The younger the child the more liable is the tetany to assume the continuous type. The child reported appears to have had the intermittent spasm ; consequently, if tetany, it represented the more unusual form of the disease. In discussing the same case Graham called attention to the fact that it is exceedingly difficult to state just what tetany is. Certain things, however, are known about its etiology. It occurs in children who have gastro-intestinal disturbances, in those who exhibit malnutrition, and not uncommonly in those who have malaria or those who live in malarious regions.

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[1] PROGRESSIVE MEDICINE, March, 1901, p. 276.

[2] Revue Mens. des Malad. de l'Enf., May, 1902.

[3] Archives of Pediatrics, March, 1902.

[4] Ibid.

The differences between tetany and *myotonia* are described by Hochsinger.[1] The tetany of infants consists of intermittent chronic contractures, principally of the muscles of the hands and feet, without loss of consciousness. Hyperexcitability is the most marked characteristic of tetany. It is very closely associated with rickets, the largest number of cases occurring during the spring months. Myotonia, on the other hand, is most common in the summer, and occurs chiefly in the course of gastro-intestinal infection. While the contractions of tetany are intermittent, those of myotonia are persistent, often lasting for weeks. In myotonia there is no mechanical or galvanic hyperexcitability of the muscles or nerves, and no laryngospasm or other disturbance of respiration.

Paresis in Children. While this disease is considered very rare in children and youth, Hurd[2] asserts that certain special forms of it have been found to occur quite frequently of late years under the age of twenty. In most of these cases there is a history of hereditary syphilis, and in some a history of acquired syphilis. While ordinarily the sexes are very unequally affected, the proportion being usually at least four men to one woman, in the juvenile paretic cases the proportion in the two sexes is nearly equal, since heredity acts impartially to both sexes.

Infantile Paralysis. In an extended and thoughtful paper on the etiology of infantile paralysis, Gossage,[3] of London, concludes that from the evidence at our disposal it is still impossible to come to any definite conclusion as to the exact nature of this disease. Clinical records are strongly in favor of several definite diseases being included under the term anterior poliomyelitis: That class where the paralysis comes on suddenly without previous ill-health ; that in which general symptoms (fever, vomiting, pain in the back) precede the paralysis ; the epidemic class, and the adult class. The three latter may possibly be the same disease, which may occur sporadically or epidemically. There are occasional sporadic cases which seem like the epidemic cases. In spite of the fact that a purely vascular lesion would best explain these striking cases where the onset is sudden, without other signs of ill-health, we are nevertheless compelled to regard such cause as improbable. The one definite fact obtainable from the post-mortem examination of patients who have suffered from anterior poliomyelitis is that in all recent cases there are signs of a local inflammation in the ventral horns. This local inflammation is probably caused by a specific micro-organism which has not yet been isolated. The reputed association with the acute specific fevers would be better explained by supposing that there is a weakened resistance to the attack of other organisms left after these complaints.

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[1] Revue Mens. des Malad. de l'Enf., June, 1902.

[2] Medical News, February 1, 1902.

[3] American Journal of the Medical Sciences, May, 1902.

An epidemic of 38 cases of infantile paralysis is reported by Painter,[1] of Boston. These cases occurred in the city of Gloucester. They could not be traced to any cause, although every clue was thoroughly investigated. They were all within a radius of four miles. R. Jones,[2] of London, asserts that a proportion of children suffering from severe spastic paralysis may be transformed into useful members of the community, improved both in body and mind, by surgical methods, and may be enabled to walk with comparatively little deformity. The irremediable cases are those of the idiotic, the microcephalic, and the irritable diplegic, who is subject to fits and active athetosis. The treatment of the hand and arm in infantile hemiplegia is less promising than the diplegic case. This is especially true if the paralysis is complete and spasm is never relaxed. The first step in treatment should be an attempt at prolonged fixation of the spastic muscles in a position opposed to the spasm. The operative treatment consists of tenotomy or tendon transplantation. Myotomy is only mentioned to be avoided. Tenotomy alone is disappointing. The treatment of paraplegia proceeds along the same lines. A special splint must be prepared upon which after operation the patient must be kept stretched for at least three months. The splint is then taken off during the day and movements sedulously practised. Crutches must be allowed until the patient can stand unsupported. Operations not followed by careful and prolonged after-care give rise to disappointment and discredit. The mere division of tendons, followed by massage and electricity, is futile. Complete recovery in spastic paraplegia is, of course, impossible, but in suitable cases the patient may be taught within one or two years to walk unsupported or with the aid of sticks.

Hydrocephalus. The treatment of 10 cases of hydrocephalus is described by Immerwol,[3] 9 of which were congenital. Antisyphilitic treatment was given to all the congenital cases. Puncture of the lateral ventricle was done in 5 cases, and in 1 tincture of iodine was injected. In the other 4 lumbar puncture was performed. No results were obtained in 8 of the cases, but 1 congenital case had recovered in six months, and when last seen, at five years, was in perfect health. The acquired case which followed meningitis also recovered. Lumbar puncture was performed repeatedly, and sodium iodide was administered. Immerwol believes that lumbar puncture should be employed in every case of acquired hydrocephalus, and may be tried in the congenital type. In the latter cases, however, antisyphilitic treatment should always be employed.

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[1] American Medicine, June 14, 1902.

[2] New York Medical Journal, September 27, 1902.

[3] Archives f. Kinderheilkunde, vol. xxxii., No. 56.

DISEASES OF THE BLOOD AND DUCTLESS GLANDS.

The Blood in Infancy. The leucocyte count in the diagnosis of the diseases of children is the subject of a valuable paper by Head,[1] of Minneapolis. Hayem (Ewing) states that the count at fifteen months in healthy infants is about 10,000 cells. It is probable that in infants in health a mild leucocytosis occurs during the first year of life, which is somewhat diminished during the second year of life. But beyond the age of two years in healthy children the leucocyte count is not different from that of adults. Of the physiological processes, that of digestion plays a prominent part in the rise and fall of the white blood cells. In all persons, old and young, there is a rise in the number of leucocytes following a meal, beginning within an hour after ingestion, and reaching its maximum within from three to four hours. In young infants the digestion leucocytosis is very marked, and must always be borne in mind, so that in making leucocyte counts a time must be selected sometime after a meal. The variability in the leucocyte count in the newborn and in the first year of life is such that in the diagnosis of diseases of this early age it cannot be relied upon except in those infections accompanied with a low leucocyte count.

From one to two years of age the count may be of considerable value if one is careful to exclude the leucocytes of digestion. Even at this age, however, the chief value in the procedure is to assist in the identification of such diseases as are characterized by a diminution rather than an increase of the number of leucocytes. This group of diseases includes typhoid fever, la grippe, measles, malarial fever, miliary tuberculosis, and perhaps tuberculous meningitis. After two years of age the leucocyte count in diseases of children is as invariable and as fixed as in diseases of adult life, and can be made as helpful in the diagnosis of diseases of childhood as it is in the diseases of the adult.

In typhoid fever in children the low leucocyte count is as constant and fixed as in adults, and complications cause a leucocytosis. Its value in children is, first, as an aid in establishing the diagnosis; second, as a means of determining the presence of complications. If the leucocyte count is over 10,000 cells the diagnosis of uncomplicated typhoid fever is not to be entertained. The exceptions to this rule are rare. If in a case of certain typhoid fever in a child the leucocyte count rises above 10,000 cells a complication is to be looked for whether the symptoms indicate it or not. In obscure cases the leucocyte count holds many times the key to the correct diagnosis.

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[1] Archives of Pediatrics, April, 1902.

The leucocyte count is of aid in the diagnosis of appendicitis. Attacks of abdominal pain from renal calculus, gallstones, acute intestinal obstruction, and typhoid fever may all simulate an attack of appendicitis in children, and all of these diseases usually have a normal or diminished count. On the other hand, acute gastritis, acute nephritis, acute enterocolitis, all cause leucocytosis, and could not be so differentiated. When the clinical symptoms are mystifying or give no clue as to the course the disease is pursuing, the leucocyte count is often valuable in aiding to follow the course of the inflammation. The symptoms of lobar pneumonia are sometimes masked, and typhoid fever, malaria, or grippe may be suspected. Here a high leucocytosis rules out these three common infections and points toward lobar pneumonia. The onset of lobar pneumonia in a child often resembles closely that of meningitis, but here the count is not of diagnostic importance, both diseases being characterized by marked leucocytosis. In the diagnosis between meningitis and uncomplicated typhoid fever the count is almost diagnostic, the latter having a normal or diminished white blood count. Numerous other diseases have been observed by Head with reference to the blood count, but the number of cases was not large.

Splenic Anæmia. Wentworth[1] holds that cases of chronic enlargement of the spleen associated with more or less anæmia should not be classified as a disease of the spleen. The term "splenic anæmia," which has been applied to these cases, implies that the anæmia is secondary to a primary disease of the spleen. This lacks proof. The changes in the spleen amount to chronic hyperplasia. This condition is a common one, and is due to a number of causes. There is a more or less marked increase in the connective tissue in the spleen affecting the pulp, the follicles, and the bloodvessels. Bacteriological examinations of the splenic tissue have given negative results, as have also inoculation experiments. The blood changes are those of secondary anæmia, in some cases severe, in others very slight. With such negative evidence as this Wentworth believes that we are not justified in giving a specific name to a condition which is so often associated with chronic diseases in other organs and tissues. Hamill[2] reports a case which he is content to call simply enlargement of the spleen with anæmia. He does not believe that we have arrived at any justifiable classification of these cases of enlargement of the spleen associated with anæmia and sometimes with cirrhosis of the liver, but is inclined to favor the view that these lesions are not the primary factors, but the results of some previously existing and as yet unrecognized condition. In some respects this case is unlike any of those recorded in the literature.

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[1] Archives of Pediatrics, September, 1902.

[2] Ibid.

Twenty cases of anæmia with enlargement of the spleen have been collected by Fowler.[1] From a study of these cases he concludes that an enlarged spleen associated with anæmia is not uncommon among children. In bad cases the blood is much altered, while in slighter ones there may be but little change The change in the blood differs from that in any other disease, and is characterized by (1) lymphocytosis due to the occurrence of numerous transitional and probably immature uninuclear cells, and (2) the presence of erythroblasts often in numbers out of all proportion to the diminution of the red blood corpuscles. The name pseudoleukæmic anæmia has been given to the more severe cases, but to draw any hard-and-fast line between these and slighter ones, or, indeed, to introduce further subdivisions based upon any particular blood change is entirely arbitrary. Since the splenic enlargement is more constant than any single change in the blood, and since both arise independently of any other disease, Fowler holds that it is not justifiable to regard these as cases of secondary anæmia. The clinical features of the condition are sufficiently definite to warrant this being looked upon as a primary disease, to which the name of splenic anæmia of infancy may be given.

An admirable paper by Osler[2] is based upon the proposition that a special malady does exist of unknown etiology, characterized by a chronic course, enlargement of the spleen, anæmia of a secondary type, a marked tendency to hemorrhage of the stomach, and a liability in the late stages to jaundice, cirrhosis of the liver, and ascites.

DISEASES OF FAULTY NUTRITION.

Malnutrition. In a paper upon the malnutrition which precedes or accompanies tuberculosis, I[3] drew attention to the fact that wasting, anæmia, and other evidence of malnutrition are constant accompaniments of tuberculosis in children. These symptoms occur in infants long before local disease can be detected, and occasionally no local signs whatever are manifested before death. In infants tuberculosis shows a special tendency to be disseminated or to conceal itself in the deep tissues, as the lymph nodes. The disease may then run a course identical with simple marasmus. In some cases a period of anæmia and wasting is followed by a state of irregular fever, after which local lesions appear, usually in the lungs. In other cases tuberculosis in children begins with well-marked local manifestations, particularly pneumonia. In these, evidences of malnutrition appear promptly and are usually progressive. The anæmia of tuberculosis, whether it appears before or after the occurrence of other symptoms, is usually simple anæmia and presents nothing characteristic. A diagnosis of tuberculosis cannot be made alone from the character of the anæmia or the malnutrition. However, persistent and increasing malnutrition in a child, without discoverable cause, is always suggestive of tuberculosis. Anæmia in adolescence should receive prompt and active attention, for it vastly increases the danger of tubercular invasion, which is particularly common at that period of life.

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[1] British Medical Journal, September 6, 1902.

[2] American Journal of the Medical Sciences, November, 1902.

[3] Archives of Pediatrics, January, 1902.

In speaking of *syphilis*, Kerley[1] asserts that there is nothing pathognomonic about the malnutrition it produces in children, but if well-directed treatment in children over three years of age fails to remove the condition of malnutrition there is good reason for suspecting that syphilis is the underlying condition. It is also well to give the child the benefit of antisyphilitic treatment, regardless of the social standing of the parents, if it is poorly developed, is easily tired, and shows a feeble vitality.

In an admirable paper by Stokes, Ruhräh, and Rohrer[2] upon the relation of the *thymus gland* to marasmus, the conclusion is reached that atrophy of the thymus is always found in cases of infantile atrophy, and that it is an index of the general condition of infants.

Rickets. This subject was considered in considerable detail last year,[3] both as to its etiology and treatment. Nothing has been added upon either point recently. In fact, pathogenesis is more open to discussion now than it was a few years ago. The various theories that have been promulgated may be thus stated:[4] 1. Parot's theory. Rickets is always of syphilitic origin and is never due to faulty alimentation. 2. The nervous theory. It is atrophic affection of the bones, brought about through the influence of the central nervous system (Pommez Tedeschi). 3. Infectious theory. It is a contagious disease (Chaumier); it is of microparasitic origin (Mircoli). 4. Alimentary theory. It is a disease of nutrition occasioned by faulty alimentary hygiene (Glisson, Petit, Guerin, Trousseau, Chorsat, Roloff, Gamba, and others). 5. Season theory. It is a disease of a certain season of the year when the blood is not sufficiently carbonized (Quiesling, Kassowitz, Schmidt, Alexander). 6. Modified alimentary theory. It is the result of faulty alimentation, and is preceded by digestive troubles, chronic dyspepsia, dilatation of the stomach, or enteritis, which profoundly disturb the process of assimilation of lime salts and favor the decalcification of the bones (Jacobi, Heitzman, Bouchard, Baginsky, Comby, and others). 7. Thymus gland theory. It is due to the deficiency of the thymus gland substance (Friedelben and Mendel). Each of these theories has had and even now has its advocates. It must be said, however, that not one is entirely satisfactory. There is still some element in its causation which we have not yet discovered.

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[1] Archives of Pediatrics, January, 1902.

[2] American Journal of the Medical Sciences, November, 1902.

[3] PROGRESSIVE MEDICINE, March, 1902, p. 271.

[4] Münchener med. Wochenschrift, 1902, No. 4; Post-Graduate, May, 1902.

The action of sterilized milk in causing rickets, which has been so freely charged, is vigorously combated by Ausset.[1] He holds that it is a wrong and injudicious use of the milk, not the sterilizing, which causes the rickets. Even breast-fed children become rachitic under bad hygienic conditions. Some interesting researches in literature have been made by Delpeuch,[2] which show that rickets has been known since the earliest days of civilization, and was then what it is now. Hyppocrates, Homer, Æsop, and Galen described the disease.

Three recent articles are referred to editorially[3] as being particularly valuable contributions to the subject, the conclusion being that we are far from unanimity as to the true cause and nature of rickets. These articles are by Edlefsen,[4] Kassowitz,[5] and Mendel.[6] Edlefsen has noticed that the majority of cases appear during the first six months of the year, their development being especially frequent during the second quarter. These facts, he believes, favor the carbonic acid theory, dwellings being generally closed during the winter months, and also explain the frequent occurrence of rickets in houses where such infectious diseases as polyarthritis, pneumonia, and cerebro-spinal meningitis have occurred. Kassowitz combats the theory of infection, arguing that rickets does not come on suddenly like most infectious diseases. Uncomplicated rickets coming on suddenly with fever does not occur; swelling of the spleen, too, is not common, and when observed it is usually in children having some blood disease or severe digestive disturbances. He is inclined to think that the repeated inhalation of the volatile product of the ammoniacal fermentation of urine is the most common cause of rickets. This proposition most observers will be very slow to accept.

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[1] L'Echo Médical, May 18, 1902.

[2] La Presse Médicale, January 8, 1902.

[3] Medical News, October 25, 1902.

[4] Deutsche Aerzte-Zeitung, 1901, Nos. 22–24; 1902, Nos. 8 and 9.

[5] Ibid., 1902, No. 3.

[6] Münchener med. Wochenschrift, 1902, No. 4.

Mendel believes that rickets is caused by inactivity of the thymus glands, and argues that the nutritive disturbances commonly looked upon as accounting for it operate only by virtue of diminishing the internal secretion of the thymus. He finds enlargement of the spleen almost always present, due, he thinks, to insufficient development of the thymus. The nervous derangements, especially laryngismus, he thinks, bear the same relation to the thymus that myxœdema bears to the thyroid. He cites Mettenheimer and Friedleben as having found the thymus atrophied in the great majority of cases of pronounced rachitis. He has tried the thymus gland as a remedy, in many instances with good results. He administers the fresh thymus of the calf, fifteen grains a day for each month of the child's life.

Chondrodystrophy Fœtalis. A case of this character is described at great length together with photographs and X-ray illustrations by J. L. Morse.[1] The condition was first described by Parrot in 1878. It is frequently confused with rickets, but has nothing in common with that disease except in external appearance, wherein the resemblance is marked. Microscopic examination, however, shows that the pathological changes which produce such similar appearances are radically different. For example, the enlargement of the ends of the long bones in rickets is due to the abnormal development of the epiphyseal cartilage; in chondrodystrophy to periosteal overgrowth. Microscopically in rickets the proliferating zone is much wider than normal; in chondrodystrophy narrower. In rickets vascularization is marked; in chondrodystrophy it is not marked. The changes in the skull are different in the two diseases. In rachitis the bones laid down in membrane as well as those in cartilage are involved; in chondrodystrophy they are not. The term "fœtal rickets" should not, therefore, be applied to this condition. It is possible, however, that true rickets may occur in intra-uterine life, recovery taking place before birth. Such a process would deserve the name of "fœtal rickets." Its occurrence seems hardly probable, however, as the time seems very limited for the development and cure of rickets, even of a mild type. While there must be some doubt as to the existence of true "fœtal rickets," "congenital rickets," that is, rickets beginning during intra-uterine life and continuing into extra-uterine life, undoubtedly occurs.

A case of this character is reported, also, by Comby,[2] who gives an excellent and extended description of its appearance and characteristics.

Scurvy. The recent literature on infantile scurvy has been exceedingly meagre. An interesting observation has been reported by Miller,[3] of Philadelphia, to show the time required by an improper food to produce scorbutic symptoms. The child thrived on a properly prepared food. An attack of indigestion having occurred, feeding with condensed milk was begun. The first mild scorbutic symptoms appeared seven weeks later, and well-developed symptoms one week later than this. A case of scurvy presenting the rather unusual complication of a fractured bone and multiple epiphyseal separations is reported by Elterich,[1] of Pittsburg.

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[1] Archives of Pediatrics, August, 1902.

[2] Archives de Médecine des Enfants, August, 1902.

[3] Archives of Pediatrics, October, 1902.

GENERAL DISEASES.

Diabetes Mellitus. Heinrich Stern[2] asserts that but 13 deaths of children under five years have been reported as due to diabetes during the past thirteen years. No cases have been reported during the past two years. It is thus seen to be a rare disease among children. When it does occur, however, it is very rapid and fatal. In one series of 38 cases its duration was but one month in 14, and about six months in 19. A few cures, however, have been reported. It is occasionally slow in its onset, but, as a rule, is very abrupt. A case of diabetes in a child, aged thirty-eight months, is reported by F. B. Swartzlander.[3] The child had been ill barely a month, and died three days after the first visit.

Arthritis Deformans. Several cases of this condition were reported two or three years ago.[4] According to Moncorvo,[5] only 48 cases have been reported. Moncorvo observed it in a child, aged five months, the first signs of the disease having appeared when the child was two months old. There was a history of hereditary syphilis, and the mother was also subject to chronic rheumatism. The deformity was limited to the fingers of both hands. As the predisposing causes, unhygienic surroundings, damp dwellings, and improper feeding are the most important. This disease is more frequent in the female than in the male, the ratio being 2 to 1. There seems to be no doubt that a hereditary disposition plays a very important rôle. According to Charcot, the affection begins in the peripheral articulation and gradually spreads to the larger joints. Favorable termination is the rule, although under some rare conditions the disease may continue to old age. The fixation of the disease at the articulations, the symmetrical and progressive course, the limitation of the inflammation to the periarticular tissue and synovial folds, are the chief diagnostic points. The treatment consists in the administration of the iodides and the use of electricity.

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[1] Philadelphia Medical Journal, October 18, 1902.

[2] Archives of Pediatrics, June, 1902.

[3] New York Medical Journal, October 18, 1902.

[4] PROGRESSIVE MEDICINE, March, 1901, p. 284.

[5] Der Kinderärzt, vol. xiii.; Post-Graduate, October, 1902.

PATHOLOGY.

By LUDVIG HEKTOEN, M.D.

CYTOTOXINS, AGGLUTININS, PRECIPITINS.

Cytotoxins. THE fundamental principles of cytotoxic actions and other specific properties of the cells and fluids in the body have been presented in previous issues of PROGRESSIVE MEDICINE. The present review, dealing largely with the results of recent investigations in this fruitful field, with their ramifications in various directions, will lose some of its fragmentary character if it is regarded as a continuation of previous reviews.

Ehrlich's doctrine of the co-operation of two distinct substances—amboceptor, intermediary or immune body and complement—in hæmolytic and other cytotoxic actions has been attacked by Buchner,[1] Gruber, and Wilde.[2] Buchner attempted to uphold his early teaching of the singleness of his alexin, the active bactericidal principle in serum, whereas the later workers almost without exception follow Ehrlich in regarding Buchner's original alexin not as a single substance, but as the sum of an "almost unending, multiple system" of interaction of two substances (Sachs).[3] The apparent exceptions to Ehrlich's law, noted by Buchner, are shown by Sachs not to be exceptions, but dependent upon peculiarities of the intermediary body and the complement in particular cases cited. The repeated demonstrations by the Ehrlich school of the multiplicity of complements and amboceptors have been followed by still further refinements in order to explain certain special and at first apparently heterodoxic phenomena, such as those cited by Buchner and others. Ehrlich, in an excellent summary of his work in this line,[4] emphasizes especially the great complexity of the receptor apparatus of the cells. A red corpuscle may have as many as a hundred or more receptors. It will be recalled that according to Ehrlich's theory the receptors are conceived as molecular groups normally concerned in assimilative metabolism. When these receptors are appropriated "others of like nature are reproduced in excess" and shed into the blood and lymph. Certainly, it is no wonder, then, if various forms of receptors from time to time occur free as intermediary bodies in the serum without previous special immunization. In this way we can conceive the antibodies to originate that are met with more or less regularly in normal serum and other fluids. Both Morgenroth[1] and Moeller[2] show in a new way that certain receptors occur in the blood serum because its injection alone suffices to produce hæmolytic amboceptors—*i. e.*, an overproduction of a certain form of receptor of the red cells. Ehrlich and Marshall[3] show that there may be amboceptors or intermediary bodies with various complementophile groups of different avidity. When such amboceptors are fully complemented they would represent compounds capable of different action, according as they were attached to this or that cell; the special complement needed to complete the cytotoxic or cytolytic reaction in a given case is called the dominant complement. It is seen that in this way the Ehrlich school meets Bordet's claim of the singleness of complement on the score that all complement may be easily removed from serum by one kind of intermediary body. Ehrlich and Sachs[4] also make clear the plurality of complementophile groups by showing that intermediary bodies can unite with complements of different resistance to heat and chemicals.

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[1] PROGRESSIVE MEDICINE, March, 1902, p. 291. [2] Arch. f. Hygiene, xliv. p. 1.

[3] Berliner klin. Wochenschrift, 1902, xxxix., 181–183, 216–219.

[4] Deutsche med. Wochenschrift, 1901, xxvii., 788 and 865; see, also, Ehrlich's Croonian Lecture, Proceedings of the Royal Society, 1900, lxvi., 430, and v. Leyden's Festschrift, 1902. For comprehensive reviews of recent work in immunity, and especially of Ehrlich's theory, see, also, Aschoff, Zeitschrift f. allg. Physiology, 1902, iii.; Ritchie, Journal of Hygiene, 1992, ii.; Wassermann, Volkmann's klin. Vorträge, 1902. Special mention is made of an admirable address on these subjects, especially on their relation to pathology, by William H. Welch, British Medical Journal, 1902, ii., 1105–1114.

Ehrlich and Marshall[5] point out that there may be substances that would correspond to inactive complements. These substances they would call complementoids, because they may unite with complementophile groups of amboceptors without producing the expected hæmolytic or other cytotoxic effect. And Wechsberg[6] suggests that certain apparent exceptions to the regular scheme of cytolytic reaction may be accounted for by amboceptoids—*i. e.*, amboceptors with only one combining group, such as the cytophile. By uniting with cells and occupying their receptors such amboceptors would prevent cytotoxic action of serums containing intermediary bodies with complementophile chains. Morgenroth and Sachs[7] mention a thermolabile amboceptor in dog's serum, showing again the variability and complexity of these bodies. They also emphasize the great variability in the complements in equine serum.[8]

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[1] Berliner klin. Wochenschrift, 1902, xxxix., 1033-1035.

[2] Ibid., 1330-1332.

[3] Ibid., 587, 588.

[4] Ibid., 297-299, 335-338.

[5] Ibid., 492-496.

[6] Wiener klin. Wochenschrift, 1902. xv., 720-725.

[7] Berliner klin. Wochenschrift, 1902, xxxix., 817-822.

[8] Ibid., 631-633.

Wendelstadt[1] brings forward strong support of Ehrlich and Morgenroth's views concerning the multiplicity of amboceptors and complements in the same serum. He immunized a goat with equal and increasing doses of beef, swine, and sheep's blood, the injections extending over several months. Absorption experiments were then made with the various amboceptors by successively exposing the serum to the different kinds of corpuscles for a suitable time at low temperatures. Later the serum was first inactivated by heating to 57° C. for thirty minutes. In this way the three amboceptors could be removed from the serum by centrifugalization of the corpuscles. In each case the specific amboceptor was removed. In this instance there were no amboceptors common to all kinds of corpuscles. By careful tests with accurately measured heat it was found that the complement for swine blood is more resistant to heat than that for ox or sheep's blood, while the latter was more resistant to the action of hydrochloric acid. In a similar manner it was possible to separate the complements in normal serum, showing without question the multiplicity of complements.

Marshall and Morgenroth[2] found that ascitic fluid from a case of cirrhosis of the liver possessed a remarkable antihæmolytic action due to the presence of an anticomplement, which prevented hæmolysis of ox corpuscles by the heated serum of rabbits immunized with ox corpuscles and reactivated by fresh guinea-pig serum. The ascitic fluid had no such effect upon sheep's corpuscles under exactly analogous conditions, showing that the serum of the guinea-pig contains two distinct complements, or, preferably, groups of complements, and that the ascitic fluid contained a "partial anticomplement." Hence, experiments of this kind by differentiating between complements support Ehrlich's theory of the plurality of complements. According to Ehrlich, anticomplements are simply loosened amboceptors with complementophile molecular groups of greater avidity than usual.

Lipstein,[3] from Ehrlich's institute, takes up the question of the absence of bactericidal action in some experiments in which there is an excess of the proper amboceptors. Neisser and Wechsberg explained this phenomenon by assuming that under certain conditions the complement was taken up by the free amboceptors, and thus prevented from completing bactericidal action by uniting to the amboceptors that had been anchored by the bacteria. Against this view it has been urged that the absence of bactericidal action may be due to agglutination of bacteria, to the presence of anticomplements, normal or produced in the course of immunization. Lipstein shows that of two immune serums, both of which were agglutinating, only one caused anchoring of the complement. This illustrates that the phenomenon here considered requires for its appearances certain relative degrees of avidity between amboceptor and complement. He shows further, by experiments with the serum of the same animal before and after immunization, that the phenomenon does not depend on any substance in normal serum. The decisive factor is the amboceptor arising during immunization. If, as claimed by Gruber, anticomplements arise in large numbers during immunization, the latter process would be a useless, even dangerous one. The removal by absorption of complements in a mixture of dead bacteria and immune serum shows that the faculty to chain complements belongs to amboceptors.

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[1] Centralblatt f. Bakt., 1902, xxxi., 469–473.

[2] Ibid., 570–572

[3] Ibid., 460–468

F. Wechsberg[1] gives a clear and interesting statement of Ehrlich's theory of antitoxic and antibacterial immunity. By ingenious refinements and elaboration the theory is made to explain various interesting phenomena which at first sight appear more or less paradoxic. Wassermann showed that the normal bactericidal powers of the serum of guinea-pigs are perceptibly increased by means of inactive (heated) normal rabbit's serum. In the terms of Ehrlich's theory this means that the rabbit's serum contains amboceptors for which there are fitting complements in the blood of the guinea-pig. Wassermann succeeded in suspending natural and artificial passive immunity by means of anticomplement. In some of his experiments Wassermann failed to obtain the expected results, the animal remaining alive. Wechsberg would explain this by assuming the existence of a second group of amboceptors with a corresponding complement which is not affected by anticomplement, and hence the animals survive because the factors for bactericidal action are present and active.

The immune serum of rabbits destroys Vibrio Metchnikoff; and normal serum reactivates immune serum made inactive by heat. Pigeon's serum is normally not bactericidal for Vibrio Metchnikoff, and it does not reactivate immune rabbit's serum, some pigeons only possessing complements that reactivate certain amboceptors in the immune serum of rabbits. Wechsberg calls attention to the possibility that the additional introduction of complements need not increase bactericidal action, because the complements may be anchored to some cell in the body with complementophile receptors. It is in such cases that anticomplements may arise, as seems to be the case in some of Wechsberg's experiments with pigeons, Vibrio Metchnikoff, and rabbit's serum. On the other hand, immunization of pigeons against Vibrio Metchnikoff resulted in the production of amboceptors for which fitting complements are present in the normal serum. Hence the amboceptors of immune pigeon's serum are differently constituted, at least in its complementophile group, from the amboceptor in immune rabbit's serum. The important conclusion of practical value to be drawn from these considerations is that effective bactericidal serums should find suitable complements in sufficient number in human serum.

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[1] Zeitschrift f. Hygiene u. Infektionschrift, 1902, xxxix., 171–200.

Flexner and Noguchi's experiments with snake venoms and snake sera indicated the existence of intracellular complements that bind various intermediary bodies to cells, and thus enable the toxic actions to take place. I give more complete abstracts of the valuable work of these industrious and able investigators under a separate sub-heading. Their results confirm in many ways and in a striking manner certain phases of Ehrlich's theory touched upon in these pages.

Preston Kyes[1] also made the important observation that certain red corpuscles contain intracellular complements, removable by washing—endocomplements. Hence, leucocytes are not the only source of complements as claimed by the French. Should the existence of special endocomplements prove to be true in the case of cells in general, the fact would be of great value in making clear to us the mechanism of various forms of cellular intoxication other than by means of venom.

The further demonstration by Kyes that a definite chemical substance like lecithin may act as complement for cobra venom in causing hæmolysis is certainly an important step. That substances of this kind may take part in the formation of cytotoxins opens a wide range of possibilities. As well put by Welch, we have within us substances that are powerful weapons, which, when seized by hostile hands, like the intermediary bodies in venoms, "may be turned with deadly effect against our own cells, but which are also our main defence against parasitic invaders."

Levaditi[2] concludes an investigation into the source of the complement (cytase) in normal animals (guinea-pigs and rats) and in animals vaccinated against the cholera vibrio by placing it within the bodies of the leucocytes, which do not give it up to the plasma during their life.

Tarassevitch[3] studied the question of the number and origin of complements, and he reaches the conclusion that there are at least two classes of complements—one with hæmolytic and cytolytic properties, derived from the epiploon, the mesenteric glands, and the spleen (organs containing macrophages); and one, bacteriolytic, contained especially in the bone-marrow, which is the origin of microphages. These two cytases—*i. e.*, complements—he calls macrocytase and microcytase. Microcytase is not hæmolytic, and macrocytase is probably not bacteriolytic. These two fairly distinct cytases only pass into the serum after destruction of the corresponding leucocytes.

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[1] Berliner klin. Wochenschrift, 1902, xxxix., 886–889, 918-922.

[2] Annales de l'Institut Pasteur, 1901, xv., 895–928. [3] Ibid., 1902, xvi., 127–155.

Ascher,[1] on the other hand, finds no support for the view that complements originate in leucocytes at least so far as that could be determined by a study of cholera immunity.

Levin's[2] experiments show that splenectomy does not affect a previously conferred hæmolytic power of rabbit's serum, nor interfere in any way with the acquisition of such power. His experiments were made upon rabbits, beef's blood being used for immunization. Normal rabbit's serum is hæmolytic for the chicken's corpuscles, and Levin found that neither old nor recent splenectomy impairs this natural property.

The theoretical interpretations of Ehrlich, Bordet, and others of the phenomena of hæmolysis and cytolysis in general have been opposed by Baumgarten and others. Baumgarten[3] regards hæmolysis in alien serum as a diffusion of hæmoglobin from the otherwise unchanged stroma of the red corpuscles, the result of osmotic disturbances favored by special substances, corresponding, he thinks, to Ehrlich's amboceptors, while the action of the complement of Ehrlich is referable to the osmotic and purely physical changes and not to digestive processes. By means of certain experiments Baumgarten claims to have shown that Ehrlich's amboceptors correspond to the agglutinins which are present in every blood. Now direct microscopic observations of hæmolysis show that in heterologous serum the red corpuscles undergo similar changes as that observed when placed in anisotonic NaCl solutions (plasmolysis and swelling with plasmoptysis). Heat destroys the substances that cause this osmotic disturbance, which may be observed readily again when heated serum is "reactivated" by fresh serum, and now the same morphological changes are seen in the red corpuscles. The addition of 4 per cent. NaCl solution (hyperisotonic) reactivates heated immune serum.

Calugareanu and Henri[4] discuss the question whether the salts in the red corpuscles leave them under the same conditions as the hæmoglobin —a problem that they studied by measuring the electrical conductivity. They used a non-electrolytic fluid, namely, solutions of saccharose, into which were introduced fixed quantities of corpuscles, and after a time the amount of diffused hæmoglobin was tested and also the electric conductibility. They found that there was no fixed relationship between diffusion of salts and of hæmoglobin from red corpuscles; often the salts may depart while the hæmoglobin remains.[1]

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[1] Centralblatt f. Bakt., 1902, xxxii., 449–456.

[2] Journal of Medical Research, 1902, viii., 116–124.

[3] Berliner klin. Wochenschrift, 1901, xxxviii., 1241-1244.

[4] Compt.-rend. de Soc. de Biol., 1902, liv., 210–212.

Fukuhara[2] has studied the morphological changes of the blood cells in hæmolysis. Constrictions and granule formations are common (erythrorhexis). Nucleated corpuscles set free the nuclei. Many of the globules resulting from these changes are soon dissolved (erythrocytolysis). In the leucocytes similar disintegrative phenomena are observed also (leucocytolysis).

Shibayama[3] found that dog's serum and goat's serum dialyzed for two days against running water lose their original power to cause hæmolysis of the red corpuscles of the rabbit and guinea-pig. The addition of normal serum does not restore the hæmolytic power, but the adding of a 2 per cent. solution of sodic carbonate does. Sodic carbonate only causes hæmolysis, however. But immune serums do not lose their action by dialysis. By testing the organs of normal guinea-pigs he found that the spleen and lymph glands normally contain hæmolysins for dog's corpuscles, and it seems as if the injection of dog's blood stimulates to overproduction of hæmolytic substances normally present.

Antidysenteric Serum Studied by Ehrlich's Methods. In order to show further the practical bearing of recent experiments in the study of cytotoxic and bactericidal action, I will cite Shiga's work with his serum for bacillus dysenteriæ.

Shiga[4] finds that normal goat's and sheep's serum are bactericidal for the bacillus of dysentery. When these serums are rendered inactive by heating they may be reactivated by non-bactericidal quantities of horse serum, showing that the latter contains the proper complements. This complementation was found possible in the case of heated immune horse serum as well, and in this connection Shiga makes the important observation that suitable complements are contained in human serum also. This must be regarded as of much importance, because an important theoretical requirement of a true bactericidal serum, namely, that corresponding complements shall be present in the blood of the patient, is met in this case. Shiga believes that the favorable practical results of the use of this serum in Japan bear out fully the significance of the laboratory demonstration. Shiga found that when larger quantities of heated immune serum were present in his reactivation mixtures there was no bactericidal action, whereas smaller quantities gave decided action. This, at first sight paradoxic phenomenon, is explained as the result of a deviation of the complements due to the excess of intermediary bodies, thus preventing the completion of bactericidal action, which requires union of complement, intermediary body, and bacterium. This is the explanation offered by Neisser and Wechsberg of the absence of cytolysis in the presence of excess of serum (complementablenkung). Shiga finds mixtures of heated immune serum (0.2 c.c.) with 2 c.c. normal goat's serum constitute a specially favorable medium for dysentery bacillus, because all the special complement is removed from the serum by this process of deviation or fixation of the complement "ablenkung." In connection with this I will mention Gay's work on vaccination and serum therapy against B. dysenteriæ,[1] showing that immune horse serum has marked protective properties.

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[1] See also G. N. Stewart, The Mode of Action by Various Laking Agents on the Blood Corpuscles, Journal of Medical Research, 1902, viii., 268-307.

[2] Ziegler's Beiträge, 1902, xxxiii., 266–275.

[3] Centralblatt f. Bakt., 1901, xxx., 760–764.

[4] Zeitschrift f. Hygiene u. Infektionskr., 1902, xli., 355–368.

Welch's Hypothesis of Bacteriogenic Cytotoxins. In his Huxley lecture on the bearing of recent studies of immunity[2] on pathology, Welch advances a most interesting hypothesis, which I believe will prove of great service in furthering our knowledge of the cellular toxins of bacterial and parasitic origin. This hypothesis is an application to pathogenic organisms of Ehrlich's theories in order to explain the production by such organisms of special cytotoxins of all kinds. Welch points out that there is "no reason why suitable substances derived from the host may not stimulate parasitic organisms, through a physiological mechanism similar to that operative in cytolytic immunity, to the production of intermediary bodies, which, if provided with the requisite affinities, have the power to link complements to cellular constituents of the host, and thereby poison the latter." Heretofore attention has been directed largely to somatogenic substances—antitoxins, amboceptors—resulting from bacterial stimuli on the cells of the host. Why should not somatogenic stimuli in a reverse manner produce bacteriogenic cytotoxins as well? Various foreign intermediary bodies, like those contained in rich measure in venoms, as shown by Flexner and Noguchi in their recent and brilliant studies, and also those in alien and immune blood serum, and to some degree in bacterial cultures, like certain hæmolysins, may find suitable complements in the fluids and cells of the human body and elsewhere. So, also, bacterial and parasitic reactive intermediary bodies produced in infection as the result of vital processes within the host may find suitable complements of somatogenic and bacteriogenic origin to complete their cytotoxic effects. It is a poor rule that does not work both ways, and there is no inherent reason why the receptor apparatus of bacteria may not be just as elaborate and complex as that of animal cells like the red blood corpuscles. Should this plausible hypothesis receive general experimental verification it will yield a desired explanation of the fact that the toxins freely obtainable, it is true, from cultures are nevertheless only a "meagre index of the toxic capacities of the same bacteria in the infected body." In the animal body the bacterial cells are subject to a much wider range of stimulation than in artificial cultures.

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[1] University of Pennsylvania Medical Bulletin, 1902, xv., 307-315.

[2] British Medical Journal, 1902, ii., 1105-1114.

Welch's hypothesis carries us along to a comprehension of the production in infections of cytotoxins with varied and specific characters, such as erythrocytotoxins, leukocytotoxins, endotheliotoxins, etc. "Looked at from the point of view of the bacterium as well as from that of the animal host, according to the hypothesis advanced, the struggle between the bacteria and the body cells in infections may be conceived as an immunizing contest in which each participant is stimulated by its opponent to the production of cytotoxins hostile to the other, and thereby endeavors to make itself immune against its antagonists. The important factors determining the issue of the contest are the relative proportions and distribution of the bacterial and the host's cytotoxins." In connection with this hypothesis it may be of interest to give the chief facts derived by Ainley Walker[1] from a study of "immunization against immune serum." Metchnikoff, Charrin, and Roger found that various bacteria (B. anthracis, B. pyocyaneus, pneumococcus, streptococcus) lost much in virulence by cultivation in their immune sera, but this was soon shown to be apparent only and due to the injection of immune serum with bacteria. Walker points out that according to Ehrlich's theory the bacteria should contain atom complexes with great affinity for the receptors in the immune serum (immune body). Eventually this would result in the liberation into the serum (free from complement) of an anti-immune body. Anti-agglutinins would form in the same way. As bacteria multiply by fission, this property would be handed down, and thus the virulence would be increased. Walker's experiments with typhoid bacillus grown in bouillon with increasing proportions of immune serum (free from complement) show conclusively that its agglutinability was diminished, its virulence and resistance to serum increased. But this increase in virulence is not nearly as marked as that obtained by successive passages of an organism through a series of animals, and this Walker would explain, at least in part, by the fact that in the heightened virulence by passage we are dealing with an example of variation produced by survival of the fittest. Then, again, the immune serum used was obtained from the horse, and it may be that the virulence for the horse was much greater than for the guinea-pig, the animal Walker used for his experiments in repeated passage. The immune serum in which the bacteria grew lost some of its protective powers and some of its agglutinative property.

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[1] Journal of Pathology and Bacteriology, 1902, viii., 34–51.

The development of antilysins seems firmly established. Does an anti-immune body form after immunization with immune serum? Walker's experiments indicate that an animal may be immunized against immune serum, but its susceptibility to the bacterium is not thereby increased. Furthermore, the immune body is not identical in different animals for the same bacterium, but exhibits a specialism to the species. In another set of experiments[1] Walker shows that progressive passage of typhoid bacilli through bacteriolytic normal rabbit's serum mixed with bouillon in proportion of 1 : 10 produces distinct increase in virulence toward rabbits and guinea-pigs, and also increased resistance to bacteriolytic serum, as shown by the plate method. Walker explains this increased virulence by assuming an increased production in the bacterium of receptors for the intermediary bodies of the host, the bacterium consequently requiring a greater number of intermediary bodies for bacteriolysis. Welch's hypothesis goes further than Walker's interesting conceptions, in that it assumes that the bacterial antibodies are numerous and capable not only of neutralizing immune bodies from the host, but also, when complemented, of poisoning the cells of the host.

Pfeiffer and Friedberger[2] show that virulent and avirulent cholera vibrios differ in the number of degree of affinity of their haptophore groups, the virulent having at least five to ten times greater avidity. Hence, the immunizing effect is dependent upon the degree of virulence of the injected culture, and virulence is synonymous with affinity for amboceptors or receptors.

Pfeiffer and Friedberger[3] injected two rabbits with anticholera serum (goat's), and found that their serum suspended the bacteriolytic action of the anticholera serum on cholera bacilli in the guinea-pig's abdomen (Pfeiffer's phenomenon). This action they ascribe to anti-immune bodies in the rabbit's serum, because of the regular proportion between the antiserums and the quantity of active serum neutralized by them. They show by further experiments that the intermediary bodies of the rabbit and the goat are radically different because not affected by the same antiserum, while those in the serum of normal and immunized goats are alike, because both are neutralized by this antiserum. Furthermore, it would seem likely from this demonstration that the relative brevity of passive immunity produced by the injection of heterologous immune serums is due to the formation of anti-immune bodies.

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[1] British Medical Journal, 1902, 1199–2000.

[2] Berliner klin. Wochenschrift, 1902, No. 25.

[3] Ibid., 1902. xxxix., 5–8.

Hæmolytic and Other Actions of Snake Venom and Snake Serum. The knowledge of the constitution and modes of action of snake venoms has been advanced greatly by the application to their study of the methods employed in the recent work on hæmolysis and other cytotoxins. At the suggestion of Weir Mitchell,[1] Flexner and Noguchi have made most interesting and valuable studies of snake venoms and sera in relation to hæmolysis, toxicity, and bacteriolysis. Among the many facts established by these workers special reference may be made to the following, because of their general bearing and scientific interest. On account of the varying degrees of resistance to heat and other influences, the various toxic elements in venoms and snake sera can be subjected to minute analysis. Flexner and Noguchi show that all venoms are polytropic—that is, contain substances with special affinities for various cells, but each physiologically distinct constituent of venom is monotropic—*i. e.*, has a specific affinity for a certain special kind of cell, be it nerve cell, red corpuscle, or endothelial cell. Thus, neurotoxin is the special toxic element in cobra venom; hæmotoxin (hæmagglutinin and hæmolysin) the chief element in various snake serums, and an endotheliotoxin or lysin that causes hemorrhages by dissolving endothelial cells—"hemorrhagin"—the chief constituent in rattlesnake venom. Now, venom toxins are not single bodies, like diphtheria and tetanus toxin, with haptophorous and toxophorous groups, but they are intermediary bodies with affinities for certain cells, and they may be complemented by substances found either in the cells and fluids of the animal poisoned or in other sera, as, for instance, in snake sera, which also contain interesting intermediary bodies. Both dried and fresh venoms are free from complement. In the case of susceptible animals the complements necessary to complete the toxic action of venom are furnished by the animal. I have said before that in some cases the complement appears to be contained within the cells themselves, and Preston Kyes has established quite definitely the presence of endocomplement for cobra venom in red corpuscles. Furthermore, that lecithin intensifies the action of complement. The intermediary bodies in snake serum are isocomplementophilic, that is, provided with proper affinities for complements in the snake serum, while the intermediary bodies in venoms are partly complementable by snake serum, but, to a larger degree, they are heterocomplementophilic, which means that they are provided with affinities for complements contained in other sera. In general, serum-intermediary and venom-intermediary bodies correspond well as to the nature of their haptophorous groups. The important general bearing of the demonstration of heterocomplementophilic intermediary bodies has been emphasized in the preceding pages. Of the various intermediary bodies of this kind I would mention especially the hæmolytic group, which contains distinct elements, with special affinities for complements. Venoms also contain hæmagglutinins, destroyed by heating to 75° to 80° C. for thirty minutes, and, hence, distinct from the hæmolytic bodies. An interesting but not as yet understood phenomenon is dissociating the action of permanganate of potassium upon corpuscles agglutinated by snake venom, first shown by Mitchell and Stewart. Snake venoms also cause solution of the white corpuscles of rabbits (leucolysis). In cobra venom there is a neurotoxic intermediary body which finds suitable receptors in the nerve cells of the guinea-pig. Still another of the toxins in snake venom is an endotheliolysin, which, by dissolving endothelial cells, leads to hemorrhages. This occurs in rattlesnake venom, and hemorrhages are characteristic of this form of snake poisoning. The peculiar effect of "hæmorrhagin," as Flexner and Noguchi term this lysin, is readily demonstrable under the microscope. Perhaps analogous substances are at work in the various hemorrhagic infections and purpuras. Finally, mention must be made of Flexner and Noguchi's experiments on the influence of venom upon the bactericidal properties of the normal blood, which show that venoms by fixing the complements of the blood destroy the bacteriolytic properties of many sera. Calmette's antivenom neutralizes both the hæmolytic and the antibacteriolytic actions of venom. This incomplete abstract of the work of the Philadelphia investigators shows what a rich field for cytotoxicologic work has been opened by the study of snake venom according to the new methods.

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[1] University of Pennsylvania Medical Bulletin, 1902, xiv., 438–448; xv, 345–362.

George Lamb and William Hanna[1] find that the venom of Russell's viper (Dabora Russellii) owes its toxicity principally if not wholly to rapid and extensive intravascular clotting of the blood. In chronic cases of dabora intoxication the coagulability of the blood is rendered deficient. When heated to 73° C. for half an hour weak solutions of venom (0.1 per cent.) lose their toxicity, but stronger solutions (1 per cent.) are diminished only in their action in causing intravascular thrombosis. Calmette's serum does not neutralize the dabora venom. The manner in which this venom causes thrombosis has not been determined.

Auche and Vaillant-Hovius[2] find that the bite of venomous snakes produces a rapid erythrocytolysis with poikilocytosis. In guinea-pigs previously injected with antivenine the bite is followed by the same changes which now are more ephemeral.

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[1] Journal of Pathology and Bacteriology, 1902, viii., 1-33.

[2] Archiv de Méd. exp. et d'Anat. path., 1902, xiv., 221-256.

Cytotoxins, Agglutinins, and Precipitins in Cold-blooded Animals. I copy here the principal conclusions of Noguchi's[1] work on hæmolysis, agglutination, and precipitation in cold-blooded animals under normal conditions and after immunization :

"1. The sera of many cold-blooded animals contain both agglutinins and hæmolysins.

"2. The sera of some cold-blooded animals contain precipitins.

"3. The amount of agglutinin, hæmolysin, or precipitin in any given serum is no measure of the amount of either of the other principles.

"4. The sera of some species of animals, while strikingly agglutinative for certain kinds of corpuscles, may be entirely or almost devoid of hæmolysins for these or even other kinds of corpuscles. Conversely, the occurrence of active hæmolysins in a given serum is likely to be attended with the existence of marked agglutinating properties for some species of corpuscles.

"5. From their manner of action, the conclusion that a multiplicity of agglutinins and hæmolysins occurs in sera is rendered highly probable.

"6. The agglutinins are active upon red and white corpuscles irrespective of whether the animal yielding them possesses both red and white or only white corpuscles. The hæmolysins are erythrolytic and leucolytic if obtained from animals possessing red and white corpuscles ; while in certain animals possessing only white corpuscles, hæmolysins, in contradistinction to agglutinins, are wholly or almost entirely absent.

"7. The serum of certain warm-blooded animals—*i. e.*, horse—exhibits agglutinating power over red corpuscles of some species of cold-blooded animals, and causes slight precipitation with a few kinds, at least, of sera of these animals."

"1. Artificial hæmolysins, agglutinins, antiagglutinins, serum precipitins, aqueous humor precipitins, and milk coagulins can be produced through immunization in certain cold-blooded animals.

"2. The hæmolysins and agglutinins for erythrocytes can be produced in animals which do not possess erythrocytes.

"3. Isoagglutinins and isohæmolysins can be produced in certain species of turtles. The isobodies thus developed have a slight erythrolytic action upon the blood of other though related species of turtles.

"4. The complements of turtle's blood are rendered inactive by a temperature of 50° C. maintained for thirty minutes.

"5. The precipitins and coagulins for aqueous humor and milk, respectively, can be produced in animals which do not possess the corresponding fluids in the strict sense.

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[1] University of Pennsylvania Medical Bulletin, 1902, xv., 295–301, and 301–307.

"6. The above facts demonstrate the widespread distribution of common receptors through the animal kingdom, and extend the chief tenets of Ehrlich's hypothesis to invertebrates and vertebrates among the cold-blooded animals."

Hæmolysins of Bacterial Origin. Many bacteria produce hæmolytic substances. Kraus, Todd, and others show that ordinary saprophytic organisms may produce very energetic hæmolysins. One often sees extensive hæmolysis in post-mortems, especially upon cases of "sepsis," especially streptococcus septicæmia and early decomposition, the hæmolysis being particularly noticeable in the diffuse red staining of the endocardium and of the intima of the larger vessels. It has been observed and commented upon ever since systematic autopsies have been made. As yet no accurate observations have been made as to the source of the hæmolysins concerned in these cases, whether produced by pathogenic or saprophytic organisms or both. The repeated demonstration of distinct hæmolytic properties in vivo on the part of pathogenic bacteria also affords a basis for explanation of the secondary anæmias in many infectious diseases. Hæmoglobinæmia and hæmoglobinuria may also find solution along this line, at least in some cases. Todd found filtrates of B. megatherium to cause hæmoglobinuria. Among recent studies of bacterial hæmolysins I would mention especially that of Besredka[1] upon streptocolysin. (See, also, under Streptococci.) Bordet, in 1897, described the hæmolytic action of streptococci in the living body of rabbits. Besredka made this the subject of an investigation. It seems that the streptococcus is naturally hæmolytic when virulent. The laked blood of a rabbit dead from streptococcus infection was inoculated in tubes containing rabbit's serum heated to 55° C. This is the best medium. Human serum, goat's serum, sheep's serum are also serviceable, especially when mixed with rabbit's serum. After incubation for twenty-four hours the culture is diluted with equal quantities of NaCl solution and passed through a Chamberland filter. The filtrate is strongly hæmolytic, and that it actually concerns a streptocolysin Besredka has shown by careful control experiments. The lysin is active toward the red corpuscles of many different animals, differing markedly in respect to specificity from some of the ordinary cellular hæmolysins. It is also peculiar as regards the effect of heat, not losing its powers before being heated for two hours at 70° C. or at 55° C. for ten hours. It does not pass through the membrane of dialyzers. It does not exercise any toxic action upon animals, and all efforts along the usual lines to obtain an antistreptocolysin have failed. The serum of vaccinated animals forms a precipitate when added to the hæmolysin (Schistowitch's reaction).

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[1] Annales de l'Institut Pasteur, 1901, xv., 880–893.

Marmorek[1] believes that all pathogenic streptococci possess the power of causing hæmolysis of rabbit's blood and do not grow in filtrates of their own cultures. The hæmolytic power of the streptococcus of scarlatinal angina is less than that of streptococci from other sources, all streptococci pathogenic for man thus belonging to the same family.

Jordan's[2] investigations of pyocyanolysin seem to show that the hæmolysing power attributed to the filtrates of B. pyocyaneus may be due to the alkalinity of such fluids.

Castellani[3] tested the hæmolytic powers of B. typhosus, B. dysenteriæ (Kruse), and B. coli. Filtrates of broth cultures passed through Berkefeld filters were tested upon the corpuscles of dogs by placing varying quantities of the filtrates—usually 0.5 c.c.—in test tubes and adding 0.85 per cent. salt solution up to 5 c.c.; to this mixture $\frac{1}{20}$ c.c. of dog's defibrinated blood was added. The tubes were then placed at 37° C. for two hours, and subsequently for twelve hours at the room temperature. B. typhosus and B. dysenteriæ produce distinct hæmolysis, but B. coli, so far as tested, does not. By treating rabbits with filtered typhoid cultures an antihæmolysin developed, 0.05 c.c. of its serum added to typhoid hæmolysin preventing hæmolysis of dog's corpuscles.

Kraus and Clairmont[4] detail experiments with hæmolysins of bacterial origin and the antilysins present in the serum of normal animals and animals immunized with various toxins. The results show that the bacterial hæmolysins and antihæmolysins are substances with fairly specific actions. Kraus and St. Ludwig[5] injected cultures of staphylococcus and of a pathogenic vibrio, both of which cause hæmolysis in vivo in the rabbit. A marked anæmia developed, but isoagglutinins or isolysins did not appear in the serum of the animals so treated. "Antistaphylolysin" is obtainable by immunization. Todd shows that B. megatherium[6] contains a strong hæmolysin which in small doses gradually produces an antilysin. Intravenous injections of 1 c.c. of the filtrate into guinea-pigs produce hæmoglobinuria.

Camus and Pagniez[7] report that the ethereal extract (Auclair) of tubercle bacilli on coming in direct contact with red corpuscles causes diffusion of hæmoglobin. This action is hindered when the dried ethereal extract first is exposed to human serum.

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[1] Berliner klin. Wochenschrift, April 7, 1902.

[2] Transactions of the Chicago Pathological Society, 1902, v., 175–178.

[3] Lancet, 1902, clxii., 440–441.

[4] Wiener klin. Wochenschrift, 1901, xiv., 1016-1018.

[5] Ibid., 382-387.

[6] Lancet, December, 1901.

[7] Compt.-rend. de Soc. de Biol., 1901, liii., 915–916.

Hæmolysins and Complements in Human Serum in Health and Disease. Human serum is normally hæmolytic for certain alien corpuscles—*e. g.*, the rabbit's—and the thought lies near at hand that this and other similar properties may undergo various more or less significant modifications in diseases of various kinds. A good deal of work has been done along these lines during the past year or two, but so far without any very striking or definite results of direct clinical value. In order that this work may yield comparable results a suitable and uniform technique must be employed. The determination of the eventual diminution of complements in certain diseases, for instance, demands such methods that the amboceptors and complements may be determined separately.

"A useful and readily applicable method for the determination separately of the intermediary bodies and of the complements of human serum is urgently needed. When one takes into consideration the plurality of complements and of intermediary bodies, the fallacies of interpretation which may arise from failure to take account of anticomplements, of anti-immune bodies, of complementoids, of amboceptoids, of deviation (*Ablenkung*) of complements, and other principles in this complicated subject, it is clear that the problem is not an easy one."

Petrie[1] recommends that in hæmolytic experiments absolutely fresh unclotted blood be used and known percentages of the hæmolytic serum in isotonic oxalate solution (0.1 per cent. sodium oxalate and 0.85 per cent. sodium chloride). Every tube should receive the same amount of blood, which should be well mixed with the fluid. The tubes should be incubated for the same length of time at 37° C., when the mixtures should be carefully centrifugalized in order to note the color of the supernatant fluid. In all cases control tubes containing only isotonic solution should be used. By using tubes of the same size the amount of hæmoglobin diffused may be estimated with greater accuracy. Walker[2] lays stress on the importance in experiments of this kind to use serum of the same age.

Gousse[3] attempts to measure the degree of hæmolytic power of serum in health and disease by estimating the amount of hæmoglobin set free in a given time under certain circumstances. He finds that the quantity of complement varies and does not depend on the number of leucocytes.

Alfred Peterson[4] points out that bactericidal serum when placed upon gelatin inoculated while fluid with bacteria (B. typhosus) by its diffusion prevents the development of the bacteria in a rather thin stratum at the top of the gelatin. Hæmolytic action may be demonstrated in the same manner. Here the hæmolytic action of the serum is marked by a gradual transparency of the medium at first clouded from the presence of intact red corpuscles mixed with it.

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[1] Lancet, 1902, clxii, 438-439.

[2] Ibid., January 4, 1902.

[3] Abstract from Russian in Journal de Phys. et de Path. gén., 1902, iv., 793.

[4] Centralblatt f. Bakt., 1901, xii., 726-731.

Halban and Landsteiner[1] show that maternal and infantile blood react differently, the maternal serum being more strongly hæmolytic, agglutinating, bactericidal, etc. Moro has shown that the serum of nursing children is more strongly bactericidal than that of the artificially fed. Malvoz[2] studied the amboceptors of the normal dog's blood. Previous observations by Wechsberg, Pfeiffer, and others have shown the presence of amboceptors for certain bacteria in the normal blood of such animals as the rabbit and the goat, and Malvoz finds an amboceptor for B. anthracis in the blood of dogs. This amboceptor is activated by complements of the serums of rabbits, guinea-pigs, and rats. The serum of newborn dogs does not contain the amboceptor, and we know that young dogs are susceptible to anthrax, while older dogs are not.

Certain complements may be diminished or lost under certain conditions. Ehrlich and Morgenroth show that phosphorus poisoning in rabbits destroys the power of serum to dissolve guinea-pig's corpuscles, because the corresponding complement is removed. Metalnikoff notes that prolonged suppuration may destroy complements, and v. Dungern that fresh emulsions of organs may bind complements.

Trommsdorf[3] studied the complement content in normal and pathological human serum by testing its hæmolytic and bactericidal powers. His results show that the complement content varies greatly both in normal and pathological—especially septic—conditions, and that no diagnostic or prognostic conclusion may be drawn from the study of complements in the blood. Neisser and Doring[4] and Kriebisch[5] have reached similar conclusions. Permanent disappearance of bactericidal substances from the blood seem to occur only shortly before death. Longcope[6] concludes a study of this question with special reference to typhoid and colon bacilli as follows:

1. Normal individuals show slight fluctuations in the bacteriolytic complement-content of their blood.
2. In many prolonged chronic affections, such as nephritis, cirrhosis of the liver, and diabetes mellitus there is a marked decrease in the bacteriolytic blood complement, which becomes more marked toward the end of the disease.

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[1] Münchener med. Wochenschrift, 1902, xlix, 474–476.

[2] Centralblatt f. Allg. Path. u. path. Anat., 1902, xvi., 624–632.

[3] Centralblatt f. Bakt., 1902, xxxii., 439–449.

[4] Berliner klin. Wochenschrift, 1901, 22.

[5] Wiener klin. Wochenschrift, 1902, 27.

[6] University of Pennsylvania Medical Bulletin, 1902, xv. 331–345.

3. Terminal infection in chronic disease is probably the direct result of the diminished state of the bacteriolytic complement.

4. The blood serum of certain individuals suffering from chronic disease does not show a reduction in complement; these individuals appear to escape terminal infection.

5. Hyperleucocytosis is frequently associated with high complement-content of the blood serum for typhoid and colon bacilli.

6. The blood serum of some typhoid fever patients shows a diminution in the specific complements for the typhoid bacillus.

7. Human blood serum contains a multiplicity of bacteriolytic complements.

Studies of this kind should be continued.

Abbott and Bergey[1] show that the daily administration of alcohol to rabbits causes a reduction of the hæmolytic complements of the blood of the animals so treated. In animals immunized for alien blood alcohol also causes a reduction in the specific hæmolytic receptor. Alcoholized rabbits are more susceptible to the toxic action of foreign serums than normal rabbits. Perhaps the increased susceptibility to infections commonly observed clinically in the case of many diseases may be connected in some way with the loss of complements and other substances that play the same rôle in bacteriolysis as in hæmolysis. The questions here touched are discussed by Wassermann.[2]

Goldberg[3] studied the influence of alcohol on natural immunity (relative), and selected the pigeon, which is relatively immune to anthrax. He found that 2 to 3 c.c. of 40 per cent. alcohol renders otherwise harmless doses of anthrax bacilli fatal. Chronic alcoholic intoxication reduces the natural resistance to anthrax.

Kribich[4] found no qualitative or quantitative differences in the hæmolytic action on rabbit's corpuscles of normal or pathological human sera.

Strauss and Wolff[5] found that the fluids of exudates have a stronger hæmolytic action than transudates of the same molecular concentration, so that this may be a means of differentiating between exudates and transudates.

Pagniez[6] studied the hæmolytic action of human serum and certain pathological fluids on the corpuscles of human and rabbit's blood. Human serum and the liquids of pleuritis and ascites are, as a general rule, hæmolytic for rabbit's corpuscles, the action being suspended by heating to 55° to 58° C. The serum of many human patients is commonly agglutinating, occasionally hæmolytic for human corpuscles.

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[1] Centralblatt f. Bakt., 1902, xxxii. (Original), 262–280, and University of Pennsylvania Medical Bulletin, 1902.

Deutsche med. Wochenschrift, February 13, 1902.

Centralblatt f. Bakt., Abt. I., 1901, xxx., 696–700, 731–741.

[4] Wiener klin. Wochenschrift, 1902, xv., 699.

[5] Fortschritte der Med., 1902, xx., 210.

[6] Thèse de Paris, 1902.

Contrary to Gousse, Camus and Pagniez[1] find a distinct relationship between the number of leucocytes and the degree of hæmolytic action of human serum upon the corpuscles of rabbits, the greater the number of leucocytes, especially mononuclear, the stronger the hæmolytic action. They encountered cases that seem to form an exception to this rule, but in these the polymorphonuclears were increased especially.

Laqueur[2] corroborates the observation of Neisser and Doering that in uræmia 1 c.c. of the serum heated to 56° C. for thirty minutes hinders the solution of the red corpuscles of the rabbit by the unheated serum (0.1 c.c. added to 1 c.c. of a 5 per cent. suspension of rabbit's blood in physiological salt solution). In other words, in uræmia inactive serum has the paradoxic effect of suspending the hæmolytic action of active serum. It is assumed that in uræmia there develops a small quantity of antihæmolysin. Neisser and Friedemann[3] point out that other explanations are also at hand—*e. g.*, the presence of amboceptoroids—*i. e.*, amboceptors that are minus either complementophile or cytophile groups. These may suspend hæmolysis by either hindering the free complements or by occupying the receptors of the corpuscles.

Iso- and Autolysins and Agglutinins. Another side of this modern study of serum concerns the hæmolytic and agglutinating actions of human serum upon human corpuscles, either from the same individual as the serum (autohæmolysin, autohæmagglutinin) or of other individuals (isohæmolysin and isohæmagglutinin). Probably the largest series of investigations bearing upon this point is by Eisenberg.[4] He studied the isoagglutinins and hæmolysins of human blood serum in various pathological conditions. A 5 per cent. suspension of blood from normal persons in 85 per cent. salt solution was used for the principal tests, which were made in hanging drops consisting of a large loopful of serum and a drop of the blood mixture. The results were noted after keeping the preparations for two hours at 37° C. and then at room temperature for twenty-four hours. He found that the serum of an individual is inactive as regards lysis of the corpuscles of that person. Isoagglutinins are present in varying quantities in the serum of different diseases. The corpuscles of individuals whose serum contains isoagglutinins were found refractory to hæmagglutinins of whatsoever origin.[5]

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[1] Compt.-rend. de Soc. de Biol., 1902, liv., 559–561.

[2] Deutsche med. Wochenschrift, 1901, xxvii., 744–746.

[3] Berliner klin. Wochenschrift, 1902, 677–679.

[4] Wiener klin. Wochenschrift, 1901, xiv., 1021–1024.

[5] See also Herter, Medical Record, 1902, lxi., 117, 118.

In 1892 Maragliano[1] stated that the serum of many diseases is destructive of the corresponding corpuscles. Eisenberg found only a few hæmolytic sera among the agglutinating, and their action usually insignificant. The hæmolytic action was suspended by heating to 55° C. for thirty minutes, and this fact Eisenberg construes as evidence of the presence of a genuine hæmolysin. From a number of experiments he found that fresh rabbit's serum added to human agglutinating serum renders the latter more or less hæmolytic for human corpuscles, indicating that the human serum contained little suitable complement, but more or less heterocomplementophilic intermediary bodies. The corpuscles of the serum containing isolysin were not affected by this mixture of lytic serum and rabbit's serum—autolysins are not present. Hence, Eisenberg's results differ from the observations reported by Maragliano and also from those of Ascoli.[2] Eisenberg examined 150 cases of various kinds in which the only common factor seemed to be destruction of blood corpuscles and cachexia. The presence in the sera of an immune body, as pointed out above, is taken to indicate that it concerns a reaction of immunity. Ascoli[3] and Hulot and Ramond found that injections of the same blood causes isoagglutinin and lysin to appear, at least in some animals (rabbits). In all the diseases that Eisenberg studied there is hardly much doubt but that blood corpuscles meet with more or less extensive disintegration, although the exact cause and manner thereof are more or less obscure; that agglutinins and lysins are the result of this resorption would seem a natural inference, though other modes of origin are also possible. The absence of hæmolytic action in the organism itself, in which the lysins form remains without any very satisfactory explanation. This question is also a point of dispute among investigators, some claiming that autolysis does occur. Whether pathological states can disarrange the protective mechanism that prevents autocytotoxins to form, whether Ehrlich's "horror autotoxicus" is ever overcome, remains a most interesting problem.

Eisenberg failed to find isoagglutinin and lysin in thirty-six urines examined.[4]

Camus and Pagniez[5] found that thirteen of twenty-four human bloods were hæmolytic for washed human corpuscles in the proportion of twenty drops of serum to 1 c.c. of blood. The effect was suspended on heating to 56° C. The cases furnishing the blood include cancer, pneumonia, chlorosis, tuberculosis, etc.

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[1] Berliner klin. Wochenschrift, 1892, p. 765. Quoted by Eisenberg.
[2] Münchener med. Wochenschrift, 1901, 1239.
[3] Wiener klin. Wochenschrift, 1902, xv., 582, 583.
[4] A good list of references is appended to Eisenberg's article.
[5] Compt.-rend. de Soc. de Biol., 1902, liv., 559–561.

Paci[1] finds that normal and pathological human serum may contain isoagglutinins, but of varying action on the corpuscles from different persons. Launois[2] points out that, while normal human corpuscles may be destroyed by the blood serum in diseases and by the fluid of pleural and peritoneal effusions, the corpuscles of the individuals furnishing the fluids are not so destroyed, probably because of antihæmolysins.

Panzacetri[3] has studied the hæmolytic effect of extracts of tumors, and found that hæmolysins of moderate power occur in many cancers.

Bard[4] also discusses the hæmolytic character of cancerous fluids. The hæmolytic power seems to be present only in the bloody fluids of cancers. This may in some cases prove of diagnostic value. He offers no suggestions as to the mechanism.

Antilysins. Besredka[5] presents an interesting study on natural antihæmolysins. He assumes a constant physiological autophagocytosis of old cells, which results in the production of autocytotoxins, and these in turn produce antiautocytotoxins. Cleverly devised experiments demonstrate that human serum contains recognizable quantities of auto-antihæmolysin (antifixator). An artificial hæmolysin was produced by injection of animals (goat) with human blood. This hæmolysin was heated to 55° C., and then there was added one part of fresh guinea-pig's serum to two parts of heated serum. This constitutes the hæmolytic mixture. It dissolves human corpuscles promptly, but this action is suspended if to two drops of this mixture there is added fifteen drops of human blood heated to 55° C. for thirty minutes. Heated serums were used in order to exclude actions of cytase in human serum and in immune serum. The same protective mechanism is present also in the serum of other animals. It is lost by heating to 67° C. The antihæmolysin is as specific as the artificial hæmolysin, and acts in doses of 15 : 1 or 20 : 1. Besredka urges the establishment of the principle of cellular autoprotection, applicable to red cells, at least in many species, and probably applicable to all cells.

Markl[6] shows that acid phosphate of sodium in certain proportions has a definite antihæmolytic effect. As it does not act directly upon the hæmolytic agent, Markl believes it protects the red blood corpuscles by changing the osmotic states of the cell membrane.

Noguchi[7] shows that various blood serums and milk exert more or less antihæmolytic action against certain hæmolysins of vegetable and bacterial nature. He believes that this hæmolytic effect, which is not specific, is dependent largely upon their cholesterin constituent.

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[1] Centralblatt f. Path., 1902, xiii., 356.

[2] Presse Médicale, January 22, 1902.

[3] Riforma Medica, May 21, 1902.

[4] La Semaine Médical, 1901, No. 26.

[5] Annales de l'Institut Pasteur, 1901, xv., 785–807.

[6] Zeitschrift f. Hygiene u. Infektionskr., 1901, xxxix., 86.

[7] Centralblatt f. Bakt. (Original), 1902, xxxii., 377–382; also University of Pennsylvania Medical Bulletin, 1902, xv., 327–331.

Vaquez and Ribierre[1] show that in icterus the red corpuscles resist the hæmolytic action of distilled water. They attribute this property to the formation in the body of the icteric of antihæmolysin by a process of vaccination by the repeated destruction of globules.

Influence of Amboceptors on Phagocytosis of Red Corpuscles. Savtchenko[2] finds that the red corpuscles (free from serum) of one guinea-pig introduced into the peritoneal cavity of another are not taken up by leucocytes. But if a little serum of a rabbit immunized against guinea-pig's blood is introduced then prompt phagocytosis of the red corpuscles results. Does the immune body act upon the red corpuscles so as to render them attackable by the phagocytes, or does it modify the protoplasm of the latter? By exposing red corpuscles of guinea-pigs to heated hæmolytic serum, so that the corpuscles absorb the immune body of the latter and then bringing the corpuscles in contact with the phagocytes without or within the abdominal cavity of a guinea-pig, there results prompt phagocytosis. Here the phagocytes are not exposed to the direct action of the immune body. But he also found that the leucocytes exposed to the immune body englobe the red corpuscles of the guinea-pig. Savtchenko urges that the immune body plays an important rôle in stimulating phagocytosis either by modifying the body subjected to phagocytosis or the protoplasm of the phagocytes themselves. Phagocytosis of red corpuscles, which occurs normally to a slight extent, has been observed to a much greater extent in a number of diseases, such as typhoid fever, and it remains to be worked out whether this phagocytosis is explainable along the lines here developed by the Russian investigator. We know that B. typhosus produces substances hæmolytic for blood corpuscles, and it may be possible that in typhoid fever the complex course of events that lead to phagocytosis of red cells include the steps here so briefly outlined. Welch, in his Huxley lectures, suggests that the typhoid bacillus produces a lymphocytotoxin and a hæmolysin, the proliferation of fixed cells being partly compensatory, partly "for the increased production of phagocytes." Flexner finds the injection of rabbit's lymphatic or marrow tissue into the goose produces a lymphotoxic serum, which causes marked proliferation of the reticulum cells in lymph nodes and bone-marrow. In pernicious anæmia there is also excessive and probably periodical phagocytosis of red corpuscles in the spleen, bone-marrow, lymph glands, and, as recently shown by Warthin,[1] in the hæmolymph glands. Here there is no evidence of ordinary hæmolysis by the serum, and the fundamental problem would seem to be to determine the mechanism of this phagocytic destruction of red corpuscles and the factors therein concerned. As the matter now stands the conditions seem analogous to those in some of Savtchenko's experiments.

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[1] Compt.-rend. de Soc. de Biol., 1902, liv., 1074.

[2] Annales de l'Institut Pasteur, 1902, xvi., 107–126.

The question in regard to hæmolytic "cytase" in normal plasma has been studied also by Levaditi,[2] who opposes the conclusion, especially of Gruber,[3] that complement is a production of the living organism circulating free in the blood. When an inactive (heated) immune hæmolytic serum is injected into the peritoneal cavity, it quickly becomes more or less active, because it comes in contact with free cytase, but Levaditi holds that this cytase is the result of phagocytolysis caused by the hæmolytic serum, and that cytase does not exist free in the peritoneal cavity normally. Many hæmolytic serums have also specific leucotoxic properties, and, when hæmolytic serum is introduced into the abdomen, the leucocytes and other cells "fix" part of the hæmolytic or leucocytotoxic substances. Savtchenko claims that on this account the white cells more rapidly take up the red. More or less erythrophagocytosis is always observed when hæmolytic serum is injected into the abdominal cavity of normal animals. Gruber based his conclusion concerning free cytase on the observation that hæmoglobinuria and hæmaturia follow the injection of inactive hæmolytic serum injected into the abdominal cavity; but Levaditi is of the opinion that this reactivation occurs in the peritoneal cavity as a result of leucocytolysis. In the animals in which a more or less pronounced peritoneal leucocytosis is provoked before the injection of hæmolytic serum, but little or no hæmolysis takes place, but so much more pronounced erythrophagocytosis and hæmoglobinuria and anæmia. This sequence of events Levaditi would explain by assuming as a conclusion from experiments that the hæmolytic substance is rapidly absorbed from the peritoneum and lodged in such organs as the spleen, which becomes the seat of an intense phagocytosis of red corpuscles. The general anæmia is the result of phagocytosis and not of intraperitoneal reactivation of the immune body. His explanation of hæmoglobinuria may seem a rather feeble one, as he ascribes it to diffusion of hæmoglobin from the corpuscles taken up by the macrophages into surrounding medium and eventually into the urine. Still, we know that in pernicious anæmia granular blood pigment is deposited in the liver and other organs far removed from the places where the red corpuscles undergo disintegration within phagocytes.

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[1] American Journal of the Medical Sciences, 1902, cxxiv., 674–718.

[2] Annales de l'Institut Pasteur, 1902, xvi., 233–256; also Compt.-rend. de Soc. de Biol., 1902, liv., 375–376.

[3] Münchener med. Wochenschrift, 1901, Nos. 46-49.

Transmission of Hæmolytic Substances to Offspring. William Bullock[1] shows that the hæmolytic properties of the serum are not transmitted to the offspring by the father (rabbits). A female rabbit immunized during or before pregnancy gave birth to young whose serum was hæmolytic. But the milk of an immunized nursing mother does not confer hæmolytic properties to the blood of the young.

Moro[2] finds that neither human nor cow's milk possesses demonstrable bactericidal properties. He shows, however, that the serum of nursing children has a markedly higher bactericidal power than of artificially fed infants. This noteworthy fact could be demonstrated in the case of the same infant by examination before and after weaning. Moro also finds that the hæmolytic power of breast infants is greater than that of bottle infants, as tested on the corpuscles of rabbits. This increase of hæmolytic substances in the serum of breast babies does not seem to depend on the greater constitutional vitality, because it obtains also in the feeblest of nurslings; hence he would ascribe the increased bactericidal powers to something introduced in the milk which we are not able to detect with our present means. The alexogenous substances of the mother's milk are, no doubt, derivatives from the alexins in her blood. As the breast milk itself is not hæmolytic or bactericidal, Moro reasons that it must contain in combination the substances that give the serum such properties.

Specific Somatogenic Cytotoxins. No new principle has been introduced into the study of specific cytotoxins of somatogenic origin. The investigations have dealt mostly with the experimental production of specific toxins or lysins for the various cells in the body, and, if we are to believe the authors whose work I have summarized in the subsequent pages, it has been found possible to produce specific serums of this kind for practically every specialized animal cell. Much of this work would seem to require repetition, however, before the results given now can be accepted as definitely established.

NEPHROTOXIC SERUM. From experiments upon a large number of rabbits, Castaigne and Rathery[3] conclude that unilateral nephrectomy is less dangerous than more conservative operations, such as unilateral ligature of the renal artery, the ureter, or ligature of the pedicle *en masse*. They believe that the kidney damaged by these operations constitutes a constant source of danger to the organism. Whether these conclusions are applicable to the human being remains an open question. In the case of unilateral nephrectomy these authors, continuing their observations,[1] found no histological changes in the opposite kidney. In this examination they paid no special attention to possible changes of the nature of a compensatory hyperplasia. In animals subjected to experimental ligatures of the renal artery, the ureter, and the entire pedicle of the kidney, they found more or less well-marked degenerative changes in the opposite kidney. These changes, which may play some part in the large mortality of the animals experimented upon, they would ascribe to the effects upon the remaining kidney of the products of the kidney thrown out of normal function by ligature of the artery and ureter; in other words, the results of autonephrotoxins. From these experiments it would seem not unlikely that certain renal disturbances heretofore described as of renorenal reflex origin or as sympathetic nephritis are caused by autonephrotoxins.

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[1] Centralblatt f. Bakt., 1902, xxxi. Referate, 180.

[2] Wiener klin. Wochenschrift, 1901, xiv., 1073-1077; also Jahrbuch f. Kinderheilk., iii..

[3] Compt.-rend. de Soc. de Biol., 1901, liii., 1150-1151.

Castaigne and Rathery[2] show further that in rabbits injected with the emulsion of the kidneys of guinea-pigs there develop lesions of the epithelium of the convoluted tubules. Similar changes develop by injection of emulsion of extirpated kidney into the abdomen of the same rabbit. The injection of renal parenchyma of one rabbit into another produces a serum that causes degenerative renal changes in other rabbits (isonephrotoxic serum). Heteronephrotoxic serum produces more marked changes. Hence it appears that the toxic substance is virtually the same in all these cases. There results a cytolysis of the convoluted tubules which they describe in detail, the essential feature being the disappearance of the protoplasmic granules.

In another article[3] Castaigne and Rathery give a more complete histological description of the lesions studied by them. An interesting part of this work is the study of the effects of various fixing agents upon the structure of the cells of the convoluted tubules of the kidney. They find that the method of Gehuchten-Sauer (absolute alcohol, 60; chloroform, 30; and glacial acid, 10) gives the most satisfactory results. Zenker's fluid, which is so extensively used as a fixing agent, gives pictures in normal kidneys that certainly might be regarded as the result of grave lesions. These authors believe, as a result of their study, that unilateral renal lesions leading to disintegration of the cells of the convoluted tubules produce substances that are toxic for the cells of the other kidney—isonephrotoxins. The work ought to be repeated.

Lindemann[4] advances the theory that in animals poisoned by small doses of chrome salts there form nephrolysins similar to those that occur in the blood of a guinea-pig injected with renal substance of rabbits. He injected subcutaneously in dogs 2 per cent. solution of chromate of potassium. On the appearance of uræmic symptoms the animal was sacrificed, and its blood injected into another dog. Lasting albuminuria with casts was produced. This evident toxicity of the serum does not depend upon chrome in the serum. He endeavors to explain these phenomena by the formation of specific amboceptors.

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[1] Loc. cit., 1152-1153.

[2] Compt.-rend. de Soc. de Biol., 1902, liv., 563-567.

[3] Archiv de Méd. exp. et d'Anat. path., 1902, xiv., 599-620.

[4] Abstract from Russian in Journal de Phys. et Path. gén., 1902, iv., 939.

Ascoli and Figari[1] show that heteronephrolytic serum on subdural injection in dogs produces rapid death, associated with, at times, convulsive, at other times, paralytic symptoms. In other words, the nephrolysin contains substances with a marked toxic action on the nervous system—neurotoxic nephrolysin. Naturally, the authors are inclined to explain uræmic symptoms as due to the action of retained substances produced when kidney tissue is undergoing absorption. They believe that nephrolysins play an important rôle in the pathology of nephritis, and that in many nephritides substances are produced also which cause increased arterial pressure and uræmic symptoms.

Bierry[2] finds that the serums of the rabbit and the duck, made leucotoxic for dog's leucocytes by the repeated injection of the latter cells, also produce albuminuria. The nephrotoxic effect is much more marked when the pedicle of one kidney is ligated first.

THYROTOXIC SERUM. Gontscharukov[3] produced a specific serum for the thyroid by injecting sheep with the emulsion of dog's thyroid in salt solution. The injections were repeated four times in each case with intervals of four weeks. The sheep's serum was then injected into dog's circulation in doses of 4 c.c. for each kilo in weight of dog, and this was repeated with a somewhat larger dose about two weeks later. Well-marked symptoms of tetany succeeded each injection. The dog was killed. The thyroid showed absence of colloid in many follicles, and vacuolation and chromatolysis of the cells. Similar changes were observed in the thyroid of a second dog treated a little differently. The analogy between the phenomena observed after operative removal of the thyroid and after injection of the serum and the changes in the thyroid of the injected dogs lead the author to believe that he has found a new cytotoxic serum. Mankowsky[4] injected thyroid tissue of dogs into the abdominal cavity of cats at intervals of two weeks. After the third injection the serum of the cats injected is toxic for the cells of the thyroid gland of dogs, causing, when injected into the latter, symptoms analogous to those seen in thyroidectomized dogs, and also degeneration of the cells of the thyroid.

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[1] Berliner klin. Wochenschrift, 1902, xxxix., 560-563, 634-636.

[2] Compt.-rend. de Soc. de Biol., 1902, liv., 1001-1004.

[3] Centralblatt f. Allg. Path. u. path. Anat., 1902, xiii., 121-124.

[4] Abstract from Russian in Journal de Phys. et d'Anat. path. 1902, v., 592.

HEPATOXIC SERUM. Hulot and Ramond[1] believe in the existence of autocytolysins and isocytolysins. In support they cite examples of injection of suspensions of liver cells of guinea-pigs into animals of the same species with the production of parenchymatous degenerations in the liver of the animals so injected. Similarly an autonephrotoxin was demonstrated for guinea-pigs. The authors suggest that during the life of an individual the continuous destruction of the cells of the liver and kidneys may give rise to small quantities of specific lysins, which, in turn, cause progressive atrophy of these organs. Further experiments along the lines here suggested may throw needed light upon other chronic processes in the organs like the cirrhoses.

Cantacuzene[2] studied the resorption of hepatic cells injected into the body of various animals. After injection into the peritoneal cavity the cells remain alive for some three days. Polymorphonuclear leucocytes are prominent during the early period of resorption of hepatic cells, no matter how introduced; but the real destruction is always accomplished by mononuclear cells which wander into the masses of liver tissue and destroy the fragments by intracellular digestion. Often these cells—macrophages—are grouped to form plasmodia or giant cells. During intracellular digestion vacuoles—phagolysis—form in the cells near the periphery, and Cantacuzene sees in this arrangement the mechanism of the passage of the "substance sensibilisatrice"—immune body—into the humors. There is no extracellular digestion of liver cells according to this author. The resorption is the more rapid the more closely related the animal injected is to the species furnishing the liver. Animals injected repeatedly acquire increased powers of resorption.

SPERMOLYSINS. London[3] studied spermolysins. He finds that normal serum possesses autospermolytic, isospermolytic, and heterospermolytic properties, the latter being the most marked. Heating to 55° C. destroys the complement, and the remaining immune or intermediary body (spermodesmon, according to London) then seems to stimulate the vitality of the spermatozoa. He gives illustrations showing the effects of normal and immune serum on various spermatozoa.

Weighardt[4] produced a serum toxic for the spermatozoa of the rabbit by injecting guinea-pigs with emulsions of rabbit's testicles. The fresh serum of normal guinea-pig reactivates promptly the spermatoxic serum heated to 56° C. for one hour, but the serum of normal rabbits frequently had no such power. He shows further that the immunization of animals with spermatoxic serum results in the formation in the latter of an anti-immune body and anti-agglutinin.

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[1] Compt.-rend. de Soc. de Biol., liii., 1133, 1134.

[2] Annales de l'Institut Pasteur, 1902, xvi., 522-552.

[3] Archiv de sciences biologique de St. Petersburg, 1902, ix.. 84, 131.

Annales de l'Institut Pasteur, 1901, xv. 832-841.

LYMPHOTOXIC, SPLENOTOXIC, AND MYELOTOXIC SERUM. Flexner[1] produced lymphotoxic, splenotoxic, and myelotoxic serums for guinea-pigs and rabbits by the injection of rabbits and geese with corresponding organs from guinea-pigs and rabbits respectively. The changes in the glands, spleen, and marrow of animals injected with such serums are well-marked, at times profound; these changes are essentially proliferative, and, to a less degree, degenerative. The response on the part of the marrow to lymphotoxin and splenotoxin is less marked than the response in spleen and lymph glands to myelotoxin. Still, the reaction in marrow is marked enough to show that it possesses lymphoid cells or at least cells closely related to lymphoid cells. The proliferation of reticulum cells is marked, and the thought lies near at hand that the pathological proliferations seen in lymph nodes in typhoid fever and other diseases may be caused by cytotoxins. Flexner points out that merely molecular changes may be sufficient to start proliferation, and that recognizable microscopic alterations heretofore regarded as necessary for proliferation, according to Weigert's hypothesis, need not be essential. In connection with this see also Ricketts.[2] By injecting lymph glands Ricketts obtained a serum, containing leucotoxin, endotheliotoxin, hæmolysin, and other special substances. The endotheliotoxin causes desquamation of endothelium and also hemorrhage.

Sulli[3] implanted the marrow of rabbits into the subcutaneous tissue of dogs on two occasions at an interval of six days. Six days after the second implantation the dog's serum was injected into a rabbit (5 c.c. for each kilogramme of rabbit), and this was repeated daily for eight days. The rabbit was then killed, and there was found marked degenerative changes in the marrow. An antimyelotoxic serum was produced in the usual way.

OTHER CELLULAR TOXINS. Centanni and Ravenna[4] report that a cardiotoxic serum may be obtainable by the usual method of procedure.

Ehrlich,[5] in a general review of his work along these lines, states that a cerebrotoxin is produced in dogs by the repeated injections with emulsified brain tissue of the goose.

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[1] University of Pennsylvania Medical Bulletin, 1902, xv., 287–295.

[2] Transactions of Chicago Pathological Society, 1902, v., 176–186.

[3] Riforma medica, January 16. 1902.

[4] Abstract from Italian, Centralblatt f. Path., 1901, xiii., 354.

[5] Deutsche med. Wochenschrift, 1901, xxviii., 865, 888, 913.

Cevidalle[1] injected the emulsion of dog's pancreas into the peritoneum of geese, the serum of which became toxic for the dog, but without special action upon the pancreas and without production of glycosuria except in case of a young dog.

Ceconi and Robecci[2] injected the ovaries of guinea-pigs into the peritoneum of rabbits, the serum of which then killed guinea-pigs, the blood undergoing hæmolysis and agglutination.

Scholten and Veit[3] found that the syncytium was markedly changed by the serum of rabbits treated with placental tissue, much more so than by normal rabbit's serum.

Agglutination. Of the numerous publications dealing with agglutination, attention is directed especially to those giving the results of investigations into the mechanism of and the factors concerned in this phenomenon. It will be seen that practically there is now unanimity in the belief that agglutination is essentially a chemical process, and it also seems clear that various chemical substances play an important part therein. No doubt further light will be thrown on the mechanisms concerned by further studies upon the relation of salts and acids to agglutination.

MECHANISM OF AGGLUTINATION. Joos[4] concludes from his experiments concerning the mechanism of agglutination that the agglutinating and agglutinable substances unite without any alteration of the bacteria, but the introduction of a trace of salt—NaCl or any one of a number of other salts—in the mixture at once causes agglutination. It seems that the salt enters into direct chemical combination with the substances concerned, and agglutination may take place in a salt-free mixture if the bacteria themselves contain salt. The union is regarded as chemical, because the relative quantities of the three substances are constant and fairly definite. The various salts are associated with more or less energetic agglutination, but no effort is made to explain the cause of this difference in their action. Joos would explain agglutination on chemical grounds and as the result of the chemical union of the three substances mentioned, the phenomenon in many respects resembling the formation of double salt.

Altobelli and Memmo[5] undertook to study the influence of mineral substances in the body on agglutination. For this purpose they applied many salts of ammonium, potassium, magnesium, calcium, barium, iron, and manganese to B. typhosus; and they found that chloride of manganese, chloride of calcium, and chloride of iron produced more or less distinct agglutination. Comparative studies show that the action varies according to bacteria, chloride of iron, for instance, which has active agglutinating powers on typhoid bacilli and colon bacilli, does not affect the cholera germ or the staphylococcus, showing that the protoplasm of the micro-organism has a decided action upon the phenomenon. They next studied the influence of salts and alkalies (1 per cent. solutions of hydrochloric and other acids, ammonium, caustic potassium, and sodium). The acids are stated to draw the bacteria into heaps indistinguishable from those produced by true agglutination. Sulphuric acid seems the most active, the action varying with the microbe. Alkalies had no agglutinating action, causing dispersion of the clumps produced by acids. They conclude that in agglutination the mineral substances play a certain rôle either by direct chemical action on the proteids which are precipitated, or by favoring osmosis between the fluid media and micro-organism, thus changing the relations between adhesion and attraction. They find support for this view in Gengou's observations, that agglutinins of human serum dialyze against distilled water.

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[1] Riforma medica, 1901, Lep. 10, 724; abstract in Arch. de Phys. et Path. gén., 1902, iv., 234.

[2] Riforma medica, September 14 and 16, 1901, 177, 783.

[3] Centralblatt f. Gynäk., February, 1902.

[4] Zeitschrift f. Hyg. u. Infektionskr., 1902, xl., 203–230.

[5] Centralblatt f. Bakt., 1902, xxxi., 221–224.

Philip Eisenberg and Richard Volk,[1] in an important article, discuss their studies on agglutination. They studied the absorption in its various phases of agglutinin by the agglutinable substance of bacteria. By means of various experiments they show that with increasing concentration of serum absolute absorption rises while the relative falls. The capacity of agglutinable substance for bacterial agglutinin is not constant, however, but the authors do not on that account question the chemical nature of the combination that takes place. When typhoid bacilli are heated to 100° C. or more agglutinability is soon lost, but they retain at least in part the power to absorb or bind specific agglutinins, so that two groups of molecules are present in the agglutinable substance. In the case of cholera germs the agglutinability is not so easily influenced by heat. Exposure of typhoid bacilli to the action of HCl destroys agglutinability, but not the power of binding agglutinin. Similarly they found two groups in agglutinins, a precipitating and a binding, the latter being the more resistant, as seems to be the case also with toxins and various lysins. Modifications of agglutinins that greatly resemble Ehrlich's toxoids are obtainable by the action of various agencies. These agglutinoids—proagglutinoids—unite with the agglutinable substance, but do not cause complete agglutination.

Eisenberg and Volk also find that various salts in different concentrations hinder more or less completely agglutination, each salt being apparently a law unto itself, similar in this respect to the action of salts upon the coagulation point of globulin (Pauli). Many acids and also alkalies seem to destroy completely the agglutinable substance, breaking up again previously agglutinated bacteria.

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[1] Zeitschrift f. Hyg. u. Infektionskr., 1902, xl., 155–195.

Shiga[1] shows that proagglutinoids readily occur in agglutinating antidysenteric serum. By absorption experiments—*i. e.*, exposing bacilli to serum—he could demonstrate that different races of dysentery bacilli have receptors for agglutinins (and proagglutinoids) that present slight differences. Again, the permanent culture of a dysentery bacillus in milk sufficed to change its receptor apparatus for agglutinins.

W. G. Savage[2] points out that clumping may occur in broth cultures of typhoid bacilli, and this fact necessitates the use of control specimens in making the agglutination test. This pseudoclumping is more marked in some races than in others, and it is probably caused by a number of chemical substances.

FORMATION OF AGGLUTININS. Ruffer and Crendriopoulo[3] studied the formations of agglutinins in the blood. They found that the cultures of a microbe (B. typhosus and B. pyocyaneus) freed from microbes by filtration, dialysis, or centrifugalization have distinct though feeble agglutinating effect; that the red cells of immunized and non-immunized animals do not contain agglutinins; in non-immunized animals the polynuclear leucocytes have an agglutinating power equal to that of the serum, and generally stronger, and in immunized animals the agglutinins appear in the polynuclear leucocytes from which they pass into the serum. At first the agglutinins are not specific, but soon specific agglutinins appear, the increase persisting for some time.

Neisser and Lubowski[4] found that the injection of agglutinated typhoid bacilli in animals usually produced no reaction, and but rarely an increase of agglutinating power in the blood. And Hans Sachs[5] shows that the injection of blood corpuscles saturated with immune body in some cases did not induce the reaction of immunity—*i. e.*, the production in the serum of immune body—showing that the molecules which bind the immune body are those which give rise to immunity. But in a few cases immune body was produced, which means, in the terms of Ehrlich's theory, that the receptors of the injected corpuscles were grasped by the receptors of the cells. Then followed an overproduction of cell receptors which entered the blood as immune or intermediary body. The non-production of agglutinin and of immune body in the majority of the experiments of Neisser and Lubowski and Sachs is urged as directly supporting the lateral chain theory, because it is explainable only on the score that the receptors of the bacteria and of the corpuscles were occupied beforehand with agglutinin and immune body, respectively.

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[1] Zeitschrift f. Hyg. u. Infektionskr., xli., 355–368.

[2] Journal of Pathology and Bacteriology, 1901, vii., 388–399.

[3] British Medical Journal, 1902, i., 821–825.

[4] Centralblatt f. Bakt., Abt. I., 1901, xxx., 483–491.

[5] Ibid, 491–494.

Brieger[1] and Schütze approached the problem of the relation of agglutinins to immunizing substances by endeavoring to extract from organisms the different substances that are at work in these reactions. Brieger extracted by chemical methods from typhoid bacilli a specific substance that Schütze found in animals produces an agglutinin specific for typhoid bacilli, but without immunizing or protective properties. The substance does not of itself cause agglutination of typhoid bacilli.

Goldberg,[2] from experimental studies on agglutination in rabbits and guinea-pigs treated with B. typhosus and B. pyocyaneus, concludes that in fatal infections the agglutinative properties are not increased. Non-fatal doses increase the agglutinative power to varying extent in different animals, but not in proportion to the degree of resulting immunity.

Hence, it would seem as if increasing agglutinative property in the blood is an early indication of efficient self-protection on the part of the infected organism.

Nicolle and Treriel[3] emphasize the fact that agglutinability and agglutinogenic powers are especially characteristic of motile bacteria, and that for this reason it would seem probable that the enveloping membrane, especially the covering of the cilia, is an essential factor in agglutination. This has been emphasized already by Malvoz, Dineur, and others, and is studied also by Defalle,[4] who finds that the injection of certain ciliated organisms, previously heated to 115° C., produces a much smaller degree of agglutinative substance than the injection of living organisms. Heating of bacilli also lessens their agglutinability by serum strongly active for living organisms. But in the case of spores and yeast, which have no ciliated membrane, heating has no such effect.

AGGLUTINATION OF PNEUMOCOCCI AND RELATIONS OF AGGLUTINATION TO PRECIPITATION. Neufeld[5] has investigated the agglutinating effect on pneumococci of immune serum obtained either from patients recovering from pneumonia or from immunized animals. As long ago as 1891, Metchnikoff observed that pneumococci grown in the serum of an immunized animal form long chains instead of diplococci. This was confirmed by a number of investigators, and Bezançon and Griffon noted the occurrence of the same phenomenon in pneumonic serum, especially on the day of the crisis. Neufeld shows that pneumococci manifest a decidedly peculiar behavior in regard to agglutination. While normal serum produces no change, twenty-four to forty-eight-hour bouillon cultures mixed with equal parts of immune serum present great swelling of the outer parts of the cocci, which become three to four times the normal size, and lose staining power, except in the central part. This change occurs also with previously killed cocci. Vigorous cultures are obtainable from mixtures of this kind with ordinary live bouillon growths. After a time small aggregations of cocci result. The occurrence of this property in post-pneumonic serum and in immunized animals is rather irregular and inconstant. If one part of serum is added to four to eight parts of bouillon there is an arrangement of the cocci into long chains which are wound into balls. Heating does not destroy the agglutinable part of the bacteria concerned in this reaction, but 100° C. of heat destroys the agglutination by serum. But loss of virulence in the pneumococci is associated with loss of agglutinability. Upon the basis of these observations Neufeld discusses the theories of agglutinability, taking up the various explanations that have been offered. He strongly favors Bordet's idea that agglutinins, by becoming fixed to agglutinable substances, cause modifications in their molecular attractions. The curious arrangement into long chains as the second phase of pneumococcal agglutination supports this physical theory of agglutination.

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[1] Deutsche med. Wochenschrift, 1902, xxviii., 478–480.

[2] Centralblatt f. Bakteriol., Abt. I., 1901, xxx., 605–617.

[3] Ann. de l'Institut Pasteur, 1902, xvi., 562–586.

[4] Ibid., 595–613.

[5] Zeitschrift f. Hyg. u. Infektionskr., 1902, xl., 54–72.

When pneumococci are dissolved in bile[1] then the addition of agglutinating or immune serum causes a distinct precipitation of the dissolved pneumococcal substance. This specific precipitation observed in connection with various bacteria (colon bacilli, typhoid bacilli) is strictly analogous with the specific precipitation of animal serums and albumins, but it has probably little to do with agglutination, because the precipitating and agglutinating substances are distinct.

Huber[2] states that if pneumococci are inoculated into the serum of pneumonics, and this kept in the incubator for twenty-four hours, then the pneumococci gather together into a more or less dense clump at the bottom; whereas normal serum similarly inoculated is rendered evenly turbid. Sometimes the pneumonia serum becomes turbid, however; but in that case it will be found that the cocci grow in long, twisted chains. Similar agglutinative phenomena are seen in the serum of immunized animals.

In order to obtain a strong agglutinating serum Neufeld employs for immunization only bacterial bodies as far as possible. These he secures by centrifugalization. The toxic substances dissolved in the bouillon cultures are thus avoided. He begins with an initial dose of killed bacteria, and follows this with living cultures. He found the agglutinating property of the serum of pneumonics especially well marked at the crisis. It may appear earlier also; the same is true of immunizing substances.

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[1] PROGRESSIVE MEDICINE, March, 1901, 305.

[2] Deutsche med. Wochenschrift, 1902; Vereins-Beilage, No. 3, January 16, 1902, 17.

Kraus and Pirquet[1] show that bacterial filtrates, in addition to specific precipitable substances, contain bodies that unite with the agglutinating substances. This is shown by the fact that, when agglutinating serum and homologous bacterial filtrates are mixed, there results a distinct loss in agglutinating power. This agglutinable substance they regard as identical with the agglutinable substance in bacterial bodies. Bialiev[2] concludes that there is no relation between agglutination and the specific precipitation of Kraus.

HÆMAGGLUTININS. Decastello and Sturli[3] find that the majority of healthy and sick more than six months old contain isohæmagglutinins, which consequently have no diagnostic importance. Landsteiner's demonstration that the corpuscles of the same person as the serum are insusceptible to auto-agglutination is confirmed. There is no relation between rouleaux formation and true agglutination.

Landsteiner and Sturli[4] find that dog's serum and horse's serum contain various groups of agglutinins for various kinds of corpuscles. Corpuscles once agglutinated may be agglutinated again with another serum. With water substances may be extracted from the corpuscles that bind the agglutinins in serums, and thus hinder the agglutinating action on the corresponding corpuscles.[5]

Ford[6] shows that hæmagglutinins, both those in normal and in immune serum, are the same substances, because their action may be suspended by antiagglutinin produced by immunization either with serum containing normal agglutinin or with serum containing artificial agglutinin.

Kraus and St. Ludwig[7] show that many bacteria produce hæmagglutinins, and that antiagglutinins are present in animals immunized against such bacteria.

Dubois[8] injected rabbits with suspensions in salt solution of the red corpuscles of the chicken heated to 115° C. in vapor for fifteen minutes. This was done three times at intervals of eight days, the rabbits being bled on the eighth day after the last injection. While the serum of rabbits treated with non-heated corpuscles has marked hæmolytic action, that of animals injected with heated corpuscles has no hæmolytic effect, but agglutinates the chicken's corpuscles strongly. By refined experiments he showed that the serum of the rabbits treated with heated corpuscles contains no corresponding specific amboceptor. In these animals there is absence also of specific precipitins. In this way it is shown again that the amboceptors and agglutinins are distinct substances.

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[1] Centralblatt f. Bakter., 1902, xxxi., 60–74.

[2] Abstract from Russian in Journ. de Phys. et Path. gén., 1902, iv., 598.

[3] Münchener med. Wochenschrift, 1902, xlix., 1090–1095.

[4] Wiener klin. Wochenschrift, 1902, xv., 38–40.

[5] See also Capogrossi, Riforma medica, 1902, 79.

[6] Zeitschrift f. Hyg. u. Infektionskr., 1902, xl., 363–372.

[7] Wiener klin. Wochenschrift, 1902, xv., 120–121.

[8] Annales de l'Inst. Pasteur, 1902, xvi., 690–693.

RELATION OF HÆMAGGLUTININS TO THROMBI OF RED CORPUSCLES. The following quotation from Welch's valuable Huxley lecture[1] shows that the hæmagglutinins may have important pathological bearings by their agglutination of red corpuscles: "I would emphasize the support given by the recognition of hæmagglutinins to views advocated many years ago by Hueter and by Klebs concerning the occurrence of thrombi composed of red corpuscles. Such thrombi I believe to be not uncommon in typhoid fever and other infections, especially in small vessels. . . . It can scarcely be doubted that substances agglutinative of white blood corpuscles are also produced by certain bacteria, and that these are concerned in the clumping of pus cells and of leucocytes within the living body, but it would not be profitable to discuss this matter without more exact information than we now possess." At the meeting of the Association of American Pathologists and Bacteriologists in Cleveland last spring, Professor Flexner showed specimens of thrombi in typhoid fever produced, he believed, by agglutination of red corpuscles.[2]

Some of the hyaline glomerular thrombi in infectious diseases may consist of agglutinated corpuscles. This may be proven to be so, also, in the case of the thrombi in the liver, in eclampsia and in other lesions, as, for instance, various chemical intoxications.

Tarassewitch and Stchastney[3] endeavor to establish that in animals immunized with blood of some other species the rapid death that follows an intravenous injection of such blood is due to pulmonary embolism of masses formed by the agglutination of the alien corpuscles. The lungs of rabbits treated with the corpuscles of geese show great accumulations of geese corpuscles in the pulmonary vessels and signs of pulmonary anæmia. Flexner[4] found that minimal fatal doses of ricin in rabbits cause in the lymph glands and Peyer's patches lesions and agglutinative thrombi. Intravenous injections of ether and of normal dog's blood produce thrombolic masses composed of agglutinated red corpuscles within the heart and large vessels of rabbits.[1]

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[1] British Medical Journal, 1902, ii., 1105–1114.

[2] University of Pennsylvania Medical Bulletin, 1902, xv., 324–327.

[3] Abstract from Russian in Journ. de Phys. et Path. gén., 1902, iv., 959.

[4] Loc. cit.

Precipitins. The most important result of recent investigations in regard to the biological test for blood is the demonstration that the reaction is not so absolutely specific as believed at first. This is shown clearly by the work of Nuttall, Linossier and Lemoine, Strübe, and others.

The continuation by Nuttall of his work on the biological test for blood in relation to zoological classification,[2] in which several hundred different kinds of blood have been tested, seems to lead to the general conclusion that an active serum may precipitate in addition to the homologous blood, the blood of closely allied species, its action being the more marked the more active the serum. Nuttall has obtained serums which give the "mammalian," the "reptilian," the "bird" reactions—*i. e.*, precipitate all the blood species of any of the corresponding classes; but he has not observed the extension of this action from one class to any of the others. The principle of absolute specificity consequently must be abandoned, and Nuttall has resorted to a volumetric measurement of the precipitate in order to determine the quantitative differences in the reaction. Others—*e. g.*, Strübe—suggest that a better method is to determine the minutest quantity that will cause precipitation in the homologous and heterologous serums. Grünbaum[3] finds that in anthropoid apes the serum reacts to antiserums for human blood exactly like the latter.

Linossier and Lemoine[4] show that saliva, albuminous urine, sperm, milk, maceration of muscles, all form precipitates with the precipitin produced by the injection of blood serum. Inversely blood serum is precipitated by the precipitin of injected milk and albuminous urine. They show further that globulin produces a much more active precipitin than serum albumin, the precipitin of serum albumin being active also for globulin. Indeed, the precipitin of serum albumin may be so feeble that its precipitates may have escaped the observation of previous investigators. These authors conclude that precipitating serums are not specific, either of chemical forms of albumin, or of the albumins of a definite species. What has been called specificness is in reality a specially intense action. (See also Rostoski[1] and Ascoli.[2]) Hence, it may be concluded that there is no specific reaction for animal and human blood, but only quantitative differences in the intensity of the reaction—quantitative differences so great, however, that the test still retains its value for differential purposes, provided it is carried out with the necessary precautions. The use of clear and sterile solutions is especially desirable; the addition of, say one part of serum to 100 parts of homologous blood, or blood extract, should give distinct flocculation within an hour.[3] The point is that the blood should be so diluted that only homologous serum has any action upon it. Heretofore this has been done unconsciously, because only minute quantities have been used. The dilutions necessary for this purpose may vary in different cases. The wisdom of intrusting forensic work of this kind to specially organized institutes is apparent at a glance, and is strongly recommended by Uhlenhuth[4] and others.

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[1] Carl Law (Dissertation, Rostock, 1901) has studied the action of vegetable agglutinins—ricin, erotin, alvin.

[2] Proceedings of the Royal Society, 1901, lxix.; Proceedings of Cambridge Philosophical Society, 1902; Journal of Tropical Medicine, December 16, 1901; British Medical Journal, April, 1902.

[3] Lancet, 1902. [4] Comp.-rend de Soc. de Biol., 1902, liv., 369-372; also 415-417.

George Strübe[5] emphasizes especially the observations of Minnorvici,[6] Linossier and Lemoine,[7] Kister and Wolf, Halban[8] and Landsteiner,[9] to the effect that the absolute specificity of the reaction can no longer be maintained. Strübe obtained reactions with serum prepared by injecting human blood in the serum of guinea-pigs, chickens, swine, monkeys, calves, dogs, goats, sheep, but only in small dilutions, the serum being active for human blood in dilutions of 1 : 20,000. Hence the effect of precipitating serum must be known both on homologous and heterologous bloods. He believes that by means of intravenous injections high precipitating values may be obtained in a short time. He found dilutions of precipitating serum in 0.08 NaCl solution of advantage, because they are cleaner than those with 0.8 salt solution. He also obtained a precipitin for semen, but this serum also caused precipitates in human serum. Similarly, serum causing precipitation in human serum also did so in clear semen mixtures. The exact relationship between precipitating serums produced by the injection of serum and semen should be investigated thoroughly because of the forensic diagnostic importance often attached to suspected seminal spots.

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[1] Münchener med. Wochenschrift, 1902, xlix., 740.

[2] Ibid., 1409–1413.

[3] Kurt Ziegler. Centralblatt f. Path., 1902, xiii., 545–556. (Complete review of biological test and its forensic importance.)

[4] Deutsche med. Wochenschrift, 1902, xxviii.

[5] Ibid., 1902, xxviii., 425–429 (see al Biondi Viertljhr. f. gericht. med., 1901, xxiii., Supplementheft).

[6] Ibid, 1902, xxviii., 429–431.

[7] Semaine Médicale, 1902. See also Linossier, Bulletin de l'Acad. de Méd., March 25 and April 1, 1902.

[8] Zeitschrift f. Medicinalbeamte, 1902, 213.

[9] Münchener med. Wochenschrift, 1902, xlix., 473.

Ziemke[1] gives a number of practical details in regard to the biological test for blood. By extracting a mummified stomach, buried for ten years, with concentrated solution of potassic cyanide, carefully neutralizing the extract with crystalline tartaric acid in substance, and then filtering, he obtained distinct reaction with specific serum. This method is recommended with blood remains that are hard to dissolve.

Mertens[2] recommends that, in order to obtain the most powerful precipitins, serum be injected directly into the veins.

Butza[3] finds that intraperitoneal injections of pleuritic serum produce in rabbits specific precipitins for human serum.

Hausner[4] recommends the use of dogs in order to secure abundant serum for the biological test of blood. He has found that serum of dogs may be rendered sensitive enough, so that 0.5 c.c. will determine the presence of one drop of blood diluted in 300 times its volume of water. One milligramme of dried human blood may be detected by this method. Specific serum also gives reactions with ascitic fluid, albuminous urine, and nasal mucus. Dried specific serum constitutes an active reagent. He recommends that medico-legal institutes keep on hand dogs injected with human blood and the blood of the more common quadrupeds and birds.

Uhlenhuth[5] gives a detailed report of the various forensic examinations of bloodstains that he has made by means of this method, with uniform and eminent satisfaction as regards the reliability of results. He carefully controls the specificity of the precipitating serums before undertaking any tests with them, and he refuses entirely to use serums that are thick and opalescent (" plethora albuminosa "), because of the ease with which precipitates develop in mixtures made with them. As yet, the rabbit is the best animal for the production of precipitating serum for human blood, and even this may present many peculiarities.

E. S. Wood[6] has applied the serum test for human blood to bloodstains upon the clothes of a murderer.[7]

W. F. Whitney[8] recommends that in every case of murder, where there is a possibility of bloodstains having to be examined, blood of the individual should be secured at the autopsy and sent upon filter paper to the one who examines the suspected stain, in order that all doubt as to this individual's blood giving a serum reaction may be set at rest.[1]

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[1] Deutsche med. Wochenschrift, 1901, xxvii., 731–733.

[2] Wiener klin. Rundschau, March 2, 1902.

[3] Compt.-rend. de Soc. de Biol., 1902, liv., 406-407.

[4] Abstract from Russian in Journ. de Phys. et Path. gen., 1902, iv., 544.

[5] Deutsche med. Wochenschrift, 1902, xxviii., 659–662.

[6] Boston Medical and Surgical Journal, 1902, cxlvi., 427–429.

[7] See also Whittier, American Medicine, 1902, iii., 96.

[8] Ibid., 429.

OTHER APPLICATIONS OF BIOLOGICAL TEST. The biological test has enabled us to determine that the albuminous molecule of various milks is different. The absence, in some instances, in suitable heated milk of the reaction of precipitation speaks for changes in the molecular constitution. Moro finds that the active substances of lactoserum may persist for months in closed capillary tubes ; they are not destroyed by heating to 56° C. The precipitating substances may be obtained by injecting pure casein. This corresponds with observations of Manille Ide in regard to various albumins. In related animals—*e. g.*, goat and cow—specificity of reaction is not absolute. While every human lactoserum gives precipitate with every human milk, yet there are considerable differences, the maximum precipitation taking place in the homologous milk (the milk injected).

Paul Theodore Müller[2] publishes the results of extensive experiments with the precipitating bodies of lactoserum.

Albert Schütze[3] shows that muscle albumin isolated by chemical means produces specific precipitins in the serum of animals injected with it. Furthermore, that vegetable albumin produces also specific precipitins, showing, he thinks, that these albuminous molecules are different from each other.

Uhlenhuth[4] has applied successfully the biological test for differentiation of meats. Specific antiserum (produced by the injection of blood) gives precipitates with meat extracts in 8 per cent. salt solution of the species furnishing the blood injected. He recommends the method as serviceable in meat inspection. Smoked hams still give the reaction.

Notel[5] has elaborated a method for detecting horse-flesh by means of specific precipitation, and v. Rigler[6] also applies the serum test in the examination of food meats. His efforts to obtain serums for certain sugars were not successful.

Evans and Gehrman suggest the use of specific serums for the determination of adulteration of cow meat with horse meat.

Centanni[7] found no autoprecipitins in normal individuals, but in tuberculous and pneumonic patients the serum acquires an energetic precipitin for the plasma of the organs affected. A. d'Ormea[1] states that the serum of patients with pellagra contains a precipitin for the cellular plasma of the tissues of the same individual, with a special predilection for that of the organs particularly involved.

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[1] For other references, see Schirokich, Vratch, 1901 ; Eisenberg, Centralblatt f. Bakt., 1902, xxxi., 773–776 ; Landsteiner and Calvo, Ibid., 781–786 ; Camus, Compt.-rend. de Soc. de Biol., 1902, liv., 100, 101 ; Halban and Landsteiner, Centralblatt f. Bakt., 1902, xxxii., 457, 458 ; Patek and Bennett, American Medicine, 1902, iv., 374.

[2] Centralblatt f. Bakt., 1902, xxxii., 521–542.

[3] Zeitschrift f. Hyg. u. Infektionskr., 1901, xxviii., 487–495.

[4] Deutsche med. Wochenschrift, 1901, xxvii., 780, 781.

[5] Zeitschrift f. Hyg. u. Infektionskr., 1902, xxxix., 373–378.

[6] Abstract in Centralblatt f. Bakt., 1902, xxxi., 545.

[7] Abstract from Riforma medica, 1902, in Journ. de Phys. et Path. gén., 1902, iv., 378.

Kraus and Eisenberg[2] find that "immunization" of various animals with antitoxic serum (diphtheria) and serum containing typhoid agglutinins does not lead to the formation of antisubstances (antiantitoxins and antiagglutinins). The precipitates that form when the serum of animals so immunized is mixed with antitoxic or agglutinating serum do not carry down the antitoxins or agglutinins. Immunization of dogs and goats with serum of rabbits previously injected with goat's milk (lactoserum) produced in the animals substances that neutralized the milk precipitating serum (antilactoserum). As the lactoserum is hæmolytic for goat's corpuscles, so the antilactoserum was found to have antihæmolytic properties.

Kraus and Pirquet[3] show that precipitins like toxins may undergo (spontaneous) changes, losing first the precipitating groups and later also the combining. A precipitin that has lost its precipitating power they, with Müller, call precipitoid, which, for a time at least, has greater affinity for the precipitable substance than normal precipitin.

Michaelis[4] finds that in specific precipitation two substances are present in the immune serum—one resists heat, the other does not. These two substances occur only in immune serum, neither being present in normal serum.

Nedrigailow[5] immunized guinea-pigs against typhoid bacilli; injected the serum intraperitoneally in rabbits until their serum contained precipitins not only for guinea-pig blood, but also for the blood of typhoid patients.

Danysz[6] concludes that the formation of precipitates in mixtures of ricin and antiricin in different proportions and the varying antitoxic and toxic properties of such mixtures shows that the two substances unite or are fixed in variable proportions. Mixtures of toxin and antitoxin does not form a single compound, but a series in which each of the two substances shows varying degrees of saturation. The antitoxins *in vitro* are fixed to toxins whose affinities they saturate without destroying them—like "immunisins" act on microbes.

From the results of a large number of experiments Castellani[7] gives the following conclusions: "1. The blood serum of animals treated with different preparations of natural albumins contains specific precipitins for the albumins. 2. The blood serum of animals treated with unfiltered bacterial cultures produces a precipitate in filtered cultures of the same bacteria. 3. The serum of animals treated with filtered cultures of bacteria likewise develops specific precipitins which produce precipitins in the filtered cultures of the same bacteria. 4. An exception was in the case of diphtheria cultures, the injection of which did not lead in my hands to the production of precipitins. 5. Animals which are treated with dialyzed typhoid cultures develop the specific precipitins in their serum. 6. There is a close connection between the agglutinins and the precipitins."

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[1] Abstract from Riforma medica, 1902, in Journ. de Phys. et Path. gen., 1902, iv., 378.

[2] Centralblatt f. Bakt., 1902, xxxi., 208–213.

[3] Ibid., 60–74.

[4] Ibid., 458–460.

[5] Ibid., 428.

[6] Annales de l'Institut Pasteur, 1902, xvi., 341–345.

[7] Lancet, June 28, 1902

Finally, I would mention that as Obermayer and Pick[1] produced immune bodies by the injection of non-albuminous substances formed in the course of tryptic digestion of certain albumins, so Klein[2] saw precipitins develop under similar conditions. But he failed to obtain antibodies by injection of starch, glycogen, sugar, or mucin.

AUTOLYSIS.

The increased attention given to the importance of ferments in physiological and pathological processes has brought into prominence the self-digestion of tissues and cells—autolysis—that often results from the unrestrained activity of certain intracellular ferments of wide and apparently constant distribution.[3] The liver, especially, contains such ferments in large amounts, and the great destruction of hepatic parenchyma in acute yellow atrophy is regarded by some as the result of autodigestion. It has been shown that many normal tissues undergo autolysis and softening if placed in warm chambers under aseptic conditions. The same is true of lung tissue in the stages of pneumonic hepatization, of carcinomata, of sarcomata, etc. Pneumonic exudate and pus in general have well-marked digestive powers. Undoubtedly the explanation of the cystic softening so frequent in many tumors, especially sarcomata, must be sought in autolytic processes. Some time ago I examined an interesting case of disseminated round-celled sarcoma with cystic softenings containing a clear, somewhat viscid fluid that digested fibrin.

Magnus-Levy[4] shows that acids of various kinds, such as lactic, butyric, acetic, are formed when liver tissues undergo autolysis under aseptic conditions. Antiseptics are not so favorable for their production. This shows that cells of higher animal tissues may cause fermentation.

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[1] Hofmeister's Beit., 1902. [2] Wiener klin. Wochenschrift, 1902 xv., 746–749.

[3] Jacoby. Centralblatt f. Path., 1902, xiii., 2–8.

[4] Beitr. zur chem. Phys. u. Path., 1902, ii., 261–296.

All tissues preserved aseptically after death undergo chemical changes that lead to formation from coagulable albumin, non-coagulable nitrogenous substances. Langstein and Neubauer[1] show that in the case of the puerperal uterus there is considerable increase of non-coagulable substances as compared with the normal uterus. Umber[2] studied autolytic processes in exudates, and found that albuminous exudates removed in sterile form and placed in the incubator under toluol show continued disintegration autodigestion of the coagulable albumin.

Pus also has a strong digestive action upon dead tissues,[3] probably due to trypsin-like ferments, dissolving meat very quickly and softening all of the tissues of the lung except the elastic fibres. Many bacteria seem totally devoid of this property, although the majority produce active digestive substances, and the failure of softening of caseous areas in tuberculosis depends probably upon the absence of such ferments in the tubercle bacillus and the lack of enzyme-bearing leucocytes. It would seem that autolysis is a normal and constant part of cell metabolism that causes pathological processes only when the proper balance in supply and loss is destroyed, and even here its results are generally beneficial, leading to the removal of useless tissues. The absorption of infarcts is an excellent example. If death of the tissue is accompanied by destruction of the enzymes it can only be removed by ferments brought in by leucocytes and bacteria ; lacking these, as in unmixed tuberculous infections, absorption does not occur. The softening of muscles that succeeds rigor mortis is a process of autolysis, as also is the juice normally expressed from muscles a short time after death ; perfectly fresh muscle yields no " muscle juice."[4]

Conradi[5] obtained the products of organs undergoing autolytic changes under aseptic conditions by expressing the fluids with Buchner's hydraulic press and then filtering through a Chamberland filter. Equal parts of the fluid were added to bouillon and inoculated with a fairly definite amount of bacteria of different kinds, the growth of which was then studied at various intervals. He found that muscle, lymph glands, liver, and spleen yield strongly bactericidal substances ; in the case of the testicles, thymus, adrenals, duodenum, bone-marrow, ovaries, lungs, tonsils, and kidneys the bactericidal action was not so pronounced, while fœtal intestine, adult pancreas, thyroid, brain, and submaxillary glands give fluids with bactericidal action. In the case of fresh normal organs similarly treated but slightly bactericidal or non-bactericidal fluids were obtained. The bactericidal substance is not destroyed by boiling for five hours; it is diffusible, and Conradi believes that it belongs or is related to the aromatic complex of the proteid molecule. He suggests that by such autolytic products infections may receive hindrance during life, and that the destruction and liquefaction of tissue in suppuration result in substances that defend against bacteria.

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[1] Münchener med. Wochenschrift, 1902, xlix., 1249

[2] Ibid., 1169-1171.

[3] Müller. XX. Congress. f. inn. Med., Wiesbaden, 1902.

[4] Vogel. Deutsche Arch. f. klin. med., 1902, lxxii.

[5] Beitr. zur chem. Phys. u. Path., 1901, i., 193

BACTERIOLOGY.

Bacteriæmia. Kretz[1] distinguishes two types of infectious bacteriæmia—one represented by recurrent fever, malaria, and Malta fever, in which the blood is the principal seat of disease and in which there is no distinct local lesion, and another in which the infection is the result of anatomically manifest primary lesions (pyæmia, tuberculosis, pest, etc.). In some instances of the second group, as in typhoid, anthrax, bubonic pest, the blood infection itself has more significance than mere transportation between primary and secondary foci. The transport of virulent bacteria by leucocytes probably is of more importance in leading to general infection than is ordinarily thought; in gonorrhœa, leprosy, influenza, metastases depend largely on this mode of invasion.

Certain diseases not infrequently are followed by secondary bacteriæmias—*e. g.*, streptococcus invasion in smallpox, in scarlet fever, in diphtheria, influenza, ulcerating pulmonary tuberculosis. Jehle has noted the occurrence in the blood of many measles and scarlet fever patients of influenza bacilli. Possibly such double and secondary infections may occur epidemically. The underlying conditions that favor such double infections are not understood well. Individual disposition, location of primary lesions, degree of virulence of micro-organism, each plays a part in the general infection, but much still remains to be learned in regard to some phases. Bacteriology demonstrates that different agents may cause diseases that clinically and anatomically resemble one another (erysipelas, bronchitis, croupous processes). Anatomical lesions of bacteriæmia are as yet insignificant and but little characteristic; the splenic swelling does not occur constantly; early imbibition of the intima with hæmoglobin (hæmolysis) speaks in favor of bacteria in the blood; the incongruence between the grave, general effects, namely, death, and the anatomical lesions is often noteworthy. Kretz then emphasizes the manifold character of the clinical and anatomical pictures that may be caused by the same etiological units. In addition to infectious intoxication and metastases, bacteriæmia must be reckoned with in our efforts to understand the nature of many diseases.

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[1] Zeitschrift f. Heilkunde, 1902, xxiii., 74

The importance, diagnostic and otherwise, of the bacteriological examination of the blood in various conditions—*e. g.*, typhoid fever, septic conditions in general—is shown by recent investigations, especially by Schottmüller[1] in the case of typhoid fever, and by Bertelsmann in other conditions. The results of research work of this sort in the case of typhoid fever have led to a complete change in the conception of the nature of the disease, which now is regarded as largely a bacteriæmic process. The work of Bertelsmann indicates that the presence of ordinary bacteria in the blood in numbers demonstrable by cultural methods is not necessarily of fatal prognostic significance.

Branching of Bacteria. H. W. Hill[2] discusses branching of bacteria, with special reference to B. diphtheriæ, the morphology and development of which he studied directly under the microscope. Hill reaches the conclusions that passive degenerative changes in dead or dying bacilli may give rise to slight irregular projections not actual branches ; that in actually growing cultures branching by apparent budding may occur, the oval or elliptical branch probably giving rise to new rods, which segment in the usual way or produce new branches again terminating in rods or in oval bodies, the original parent stem not undergoing degeneration. Active multiplicative branching may be reversionary or evolutionary, the exact significance not being understood as yet, especially so far as the problem concerns the species. The relation between branches and metachromatic granules is probably not a very definite or constant one. Like Meyer, Hill believes it more advisable to readjust the definition of the word bacillus than to institute radical changes in the nomenclature because of the occurrence of branching bacteria.

In our laboratory at Rush Medical College, Ludwig M. Loeb[3] found that in old bouillon cultures greatly concentrated by evaporation there occurred branching tubercle bacilli in unusual abundance and complex in structure. This observation led him to attempt the production of branching forms by the use of media containing varying amounts of salts. Only partial success was obtained in the case of tubercle bacilli, because of the slight growth of bacilli in media containing 2 to 4 per cent. of common salt. The typhoid bacillus in plain bouillon with 2 per cent. salt presents not a few branching forms. Loeb believes with

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[1] Münchener med. Wochenschrift, 1902, xlix., 1561-1565.

[2] Journal of Medical Research, 1902, vii., 115-127.

[3] Transactions of the Chicago Pathological Society, 1002, v., 147-149.

Fischer that osmotic disturbances are responsible for branching forms under these conditions.

Hill[1] has devised a method of "hanging block" preparations of agar-agar for the microscopic observations of developing bacteria, together with a simple form of worm stage that promises to yield good results in the study of the growth and development of individual bacteria. Details must be sought in the original.

A. P. Ohlmacher[2] observed lateral buds and short, true branches in cultures of colon bacilli from the heart's blood.

Conjunctival Route of Infection. Hirota[3] studied experimentally the problem of infection through the normal conjunctiva. In PROGRESSIVE MEDICINE for March, 1901, pp. 310, 311, I briefly abstracted the work of Römer and of Mayer on the same subject. It will be recalled that an important conclusion from these investigations was the liability of general infection by way of this membrane, especially in the presence of much dust, which seems to prepare the way for the bacteria by causing small erosions. Hirota finds from his experiments that B. anthracis only rarely reaches the general circulation when deposited upon the healthy conjunctiva. In the case of mice the bacillus of mouse septicæmia and the pneumococcus frequently became generalized when dropped into the conjunctival sac; the same is true of chicken cholera in the case of mice as well as rabbits. Bacillus of swine pest and bacillus mucosus capsulatus do not become generalized. Hirota agrees with Römer's conclusion that in the cases of infection by this route the bacteria enter the circulation not directly from the conjunctiva, but from the mucosa of the nose to which they are carried by the tears along the lacrymal passages.

The researches of Randolph[4] on the effect of bacterial toxins on the eye lead to the following conclusions: Numerous toxins instilled into the conjunctival sac produce no lesions, but the same toxins injected into the substance of the conjunctiva or the anterior chamber invariably cause local inflammation, and it was possible in this way to prove the presence of toxins whose existence could not be demonstrated in any other way. Injections of this kind are recommended as delicate biological tests for the detection of certain toxins.

Effect of Oxidases on Toxins. It is quite probable that the oxidases will be found of essential importance in pathological processes, since they are so prominent in normal metabolism. Up to the present time they have chiefly been studied as destroyers of toxic substances. The ability of the morphinomaniac to use progressively increasing quantities of the drug is said to be due to a corresponding increase in the power of the body cells to oxidize morphine. N. O. Ziber-Choumova[1] has studied the action of oxidases from various sources upon toxins and abrin. They are found to be especially destructive of diphtheria toxin, acting not only *in vitro* but *in vivo*. The peroxides of calcium and hydrogen remove the poisonous powers of tetanus toxin, diphtheria toxin, and abrin, while the animal and vegetable oxidases do not affect abrin, although destroying the bacterial toxins. Fibrin of blood of horses immune to diphtheria is said to contain an oxidase that can be extracted, while no such enzyme can be found in the fibrin of normal horses. This work is said to have been corroborated by Zencki.

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[1] Journal of Medical Research, 1902, vii., 202–212.

[2] Ibid., 134–136.

[3] Centralblatt f. Bakt., 1902, xxxi., 225–245.

[4] American Journal of the Medical Sciences, 1902, cxxiv., 771–796.

Effects of Electric Currents and X-rays on Bacteria. Zeit[2] presents a careful study of the action of direct, alternating, Tesla currents and X-rays on bacteria. He shows that a continuous current of 260 to 320 milliampères kills bacteria of low thermal death-point in ten minutes, the effect being purely physical. But a continuous current of 48 milliampères even when continued for two or three hours does not affect bacteria. A continuous current of 100 milliampères in seventy-five minutes kills all non-resistant bacteria by the production of electrolytic germicidal products. The continuous current produced by means of non-polarizing electrodes and the exclusion of the chemical effects of ions is neither bactericidal nor antiseptic. Hence continuous electric currents have no direct bactericidal properties, but destroy bacteria either by physical effect or by chemical action. Tesla currents have no antiseptic or bactericidal properties when passed around a bacterial suspension within a solenoid. Brush discharges produce ozone and kill bacteria. Zeit was not able to kill bacteria in bouillon or hydrocele fluid after forty-eight hours' exposure to the X-ray at a distance of 20 millimetres from the tube. Agar plates exposed for four hours were not killed. Tuberculous sputum exposed for six hours did not lose its infectious properties, hence the X-rays have no direct bactericidal action.

Rieder,[3] on the other hand, finds that plate cultures of different bacteria exposed to the X-rays for a period of twenty to thirty minutes generally suffer an almost complete arrest of development.

Iodophilia of Leucocytes in Infections. Kaminer[4] shows that leucocytes give the iodine reaction for glycogen (iodophilia) in a number of experimental infections, as is known to be the case also in many spontaneous infections in man. While diphtheria toxin gives rise to iodophilia, tetanus toxin does not, indicating that the leucocytes offer no suitable receptors for tetanus toxin. Kaminer finds that pathological stimuli give rise to the formation of iodophilic leucocytes in the bone-marrow.

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[1] Annales d. l'Acad. med. Militaire d. St. Petersburg, 1902, 695.

[2] Journal of the American Medical Association, November, 1901.

[3] Münchener med. Wochenschrift, March 11, 1902, 402–404.

[4] Verh. Congr. f. Innere Med., 1902, xx., 184–189.

Diagnostic Application of Bacteriolytic Serum. O. Voges[1] recommends on the basis of his experiment the use of the specific bacteriolytic serum reaction for the differential diagnosis of various bacteria belonging in the group of those causing hemorrhagic septicæmia. By immunization specific serums were obtained which in small doses (0.01) protected guinea-pigs injected with fatal doses of any of the corresponding bacteria.

Pathogenic Cocci. STREPTOCOCCI. Marmorek[2] finds that by adding to peptonized beef bouillon a certain quantity of glycocoll and of leucin the streptococcus grows in it for a longer period and produces a toxin of more constant strength—(*a*) bouillon, 150 grammes; leucin. 0.40 gr.; heat to 60° C. and filter through porcelain cylinder; (*b*) bouillon, 100 grammes; glycocoll, 0.50 gr.; heat and filter as above, Of each of these solutions 10 gr. are added to 250 grammes of peptonized bouillon. The streptococcus grows even in the filtrate of a culture in this medium.

According to Marmorek the streptococcus always produces marked toxic effects when the resistance of the infected person hinders the immediate generalization of the organism. In a streptococcus septicæmia each unit produces less toxin than it is capable of doing. So he uses a medium containing the serum of an animal more or less refractory (guinea-pig) to streptococcus and also leucocytes from an immunized guinea-pig. A guinea-pig previously immunized two or three times with antistreptococcic serum receives an injection of bouillon in the peritoneal cavity, and the resulting accumulation of leucocytes is added to guinea-pig's serum. Marmorek does not give further details. He states that all streptococci of different origin give the same toxin; it is destroyed by heating to 70° C., and serum obtained by the injection of the toxin of streptococcus is active against all streptococcus toxins. He has obtained toxins of such strength that rabbits are killed by doses of 0.25 to 0.50 c.c.

He[3] also refuses to attach any importance to ordinary morphological characteristics in establishment of various species of streptococci. But slight modification in the medium suffices to efface or create some of the characters regarded as peculiar to certain species. The growth on glycerin agar in small transparent points and the regularly round form of the cocci are the most constant characteristics. He lays special stress upon three biochemical characters as common to all streptococci, namely, hæmolysis of the rabbit's blood *in vivo*, the inability of streptococci to grow in filtrates of their own cultures, and the protective action of antistreptococcus serum against all streptococci.

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[1] Centralblatt f. Bakt., 1902, xxxi., 645–650.

[2] Ann. de l'Institut Pasteur, 1902, xvi., 169–171.

[3] Ibid., 172–178.

In vivo hæmolysis increases with the virulence of the streptococcus. *In vitro* the activity of hæmolysis varies considerably, depending on the origin of the microbe. Hæmolysis is readily tested by inoculating streptococci on glycerin agar mixed with a little defibrinated blood ; as hæmoglobin diffuses, a clear halo forms around the colonies. Testing in this way the hæmolytic powers of a large number of streptococci from various sources (erysipelas, puerperal fever, scarlatinal angina, pneumonia of measles, variolous pustules, diphtheria, tuberculosis, equine anasarca, and "gourme"), Marmorek found that the streptococcus of scarlatinal angina has a less active hæmolysin than the other streptococci, but the differences seem quantitative and not qualitative. He claims that antistreptococcus serum exercises a favorable influence upon the streptococcus complications of scarlatina. This also has been claimed by Moser,[1] Baginsky,[2] and Charlton.[3] The first two employed for immunization streptococci isolated from scarlet fever. Sufficient observations are not at hand to form definite conclusions in regard to this point.

All streptococci tested, except those of scarlatina and "gourme," fail to grow in filtrates of streptococcus cultures in ordinary bouillon. These two, however, form a distinct exception to this rule.

Marmorek's antistreptococcus serum, consisting of a mixture of the serum of horses injected with streptococcal bodies with that of horses injected with streptococcus toxin, protects rabbits against fatal doses of streptococci, including the streptococcus of scarlatina. It does not protect against the streptococcus of "gourme." Exaltation of virulence may be secured in all streptococci by the method referred to a moment ago. Hence, Marmorek concludes that all streptococci so far encountered in human lesions are members of one family, and he urges the unity of the streptococci pathogenic for man.

Vincent[4] also discusses the morphological variations of streptococci, and shows that much of this variability depends on the reaction of the media. He describes a branching streptococcus.

Fritz Meyer[5] finds that streptococci are agglutinated by antistreptococcus serum, and that in this way it is possible to show absolute differences between streptococci obtained from different human lesions. He used cultures in peptone bouillon isolated from colonies on ascites agar, and remarks that only diffusely turbid cultures are of any service. The tests were made in small tubes. One serum agglutinated a streptococcus from pleuritic exudate, while three other sera had no such effect. Agglutination shows itself by the formation after a few hours of a firmly rolled mass in an otherwise clear fluid. This mass by shaking may be broken up into granules. Another serum agglutinated only the corresponding streptococcus. Meyer claims to have obtained results showing that the more closely related the lesions (human) from which the streptococci are isolated the more nearly do they respond in the same manner to a serum produced by immunization with a human streptococcus. And streptococci originally refractory to a serum produced by immunization of mice eventually became agglutinable by passages through this animal. These observations indicate that passage of streptococci through animals profoundly alter the character of their receptors or their chemical construction at the same time as the virulence may be increased. Some such explanation as this may be the real one of the fact that while streptococcus serum has decided effect in the case of animals of the species used for immunization it may have no effect on human streptococcus diseases.

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[1] Wiener klin. Wochenschrift, 1902, xv., 1033.

[2] Deutsche med. Wochenschrift, 1902, xxviii. [3] Montreal Medical Journal, 1902.

[4] Arch. de Med. exp. et d'Anat. path., 1902, xiv., 521–524.

[5] Deutsche med. Wochenschrift, 1902, xxviii., 751–752.

Longcope[1] contributes an article on streptococcus mucosus (Howard) and its relation to micrococcus lanceolatus. He isolated bacteria strikingly similar to streptococcus mucosus from three cases, in one of them from the blood, and the solidified lung of a case of acute lobar pneumonia. In this case the organism first appeared as a typical pneumococcus. In all distinct capsules appeared about long chains as well as about single pairs, the colonies becoming relatively large, moist, and glutinous. The virulence was slight. Longcope regards these forms as transient variations due to peculiar environment and as indicating that Howard's capsulated streptococcus may be a variety of micrococcus lanceolatus. I may recall that Bordet, in 1896, showed that streptococcus pyogenes, when injected in non-fatal doses into the abdominal cavity of rabbits, may acquire a distinct mucoid sheath.

Kindborg[2] describes a pneumococcus that liquefies gelatin.

A. P. Ohlmacher[3] describes a streptococcus characterized by a remarkable polymorphism on Loeffler's serum, the irregular bacillary forms with clubbed and swollen ends being so frequent that it may be mistaken for diphtheria bacilli.

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[1] Journal of Medical Research, 1902, vii., 220–230.

[2] Centralblatt f. Bakt., 1902, xxxii., 573–575.

[3] Journal of Medical Research, 1902, vii., 132–134.

Gonococci. Lyder Nicolaysen[1] mentions two cases in which he has succeeded in obtaining growths of gonococci on agar. In both cases it concerned gonorrhœal joint affections. He believes that certain races of gonococci have this power to grow on agar.

Wildbobz[2] claims that gonococcus may grow upon serum-free agar and in serum-free bouillon, if first grown upon human serum-agar for two or three generations. This was also stated by Wertheim in his work on the gonococcus in 1892. Thalmann,[3] in 1900, showed that gonococci grow upon serum-free agar and serum-free bouillon to which is added two-thirds the quantity of sodium hydrate necessary to make the media neutral to phenophthalein. It is this particular reaction that is essential. Thalmann's observations appear to be confirmed by Stromberg.[4] Czaplewski[5] describes an improved method of mixing pigeon's blood with melted agar in order to obtain a specifically favorable medium for the influenza bacillus.

Nagano[6] describes a sarcina, which he isolated from an ovarian abscess and which gives rise in the pus to gonococcoid degenerative forms. He cautions against the general custom of regarding all biscuit forms that occur in gonorrhœal pus and do not stain by Gram's method as gonococci. The sarcina he describes was pathogenic for mice and rabbits.

Bacterium Pyogenes Ramosum. Stefansky[7] isolated a markedly pleomorphous organism from the pus of an abscess in the leg. It may assume the form of a coccus, short plump bacillus, rods with irregular swellings and branchings. In media containing 5 per cent. NaCl and in pigeon's blood its forms are especially atypical. The organism is motile, does not stain by Gram's method, non-liquefying, acid-producing ; it does not coagulate milk. It is harmless for rabbits and guinea-pigs in intravascular injection, but produces abscess when injected subcutaneously. It is very pathogenic for pigeons, both in living cultures, in sterilized cultures, and as filtrate.

Pathogenic Bacilli. New Bacterium in Sputum. Ludvig Jehle,[8] in the course of sputum investigations, came across an exceedingly pleomorphous organism, which he describes fully. The colonies on agar resemble the Friedländer group, but in the early elective growth on hæmoglobin media is seen a relationship to B. influenza. On neutral agar the colonies are glistening. Morphologically the resemblance to the proteus group is pronounced, but the organism does not grow on gelatin. The organism resembles somewhat Bordoni's proteus hominis capsulatus.[1] In two cases of tuberculosis, in the sputum of both of which this bacterium had been found frequently, the autopsy showed markedly hemorrhagic lesions in the lungs, and in one case in the bronchial glands, and in such areas the organism in question was present. The infection most likely took place from existing tuberculous cavities. The organism is pathogenic for guinea-pigs, death occurring some four to five weeks after intraperitoneal inoculation, the lesion being a hemorrhagic pleuropneumonia. Jehle's description of the character of the lesions is only a superficial one, and the study of the organism is incomplete in some respects.

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[1] Nordskt med. Arkiv., 1901, Afd. ii.

[2] Centralblatt f. Bakt., 1902, xxxi., 128–131.

[3] Ibid., 678–680.

[4] Quoted by Thalmann.

[5] Centralblatt f. Bakt., 1902, xxxii., 667–670.

[6] Centralblatt f. Bakt., Original, 1902, xxxii., 327–342.

[7] Ibid., 1902, xxxi., 86–92.

[8] Ibid., 1902, xxxii., 102–200.

Paul Clairmont,[2] in a laborious investigation on differential diagnosis of capsule bacteria, found that agglutinins and immunizing substances do not develop with any degree of regularity or constancy in animals injected repeatedly with various races of these organisms. These results show that in respect to agglutination and immunization capsule bacteria are a law unto themselves. Clairmont was, therefore, compelled to study the cultural and biological properties. Capsule formation in the animal body, immotility, non-liquefaction of gelatin, and mucoid growth upon agar are common characteristics of the whole group.

BACILLUS OF SOFT CHANCRE. Himmel,[3] in a clever study of immunity for the bacillus of soft chancre, shows that coagulated blood allowed to stand for a time or heated for thirty minutes to 55° C. is a good medium for the bacillus described by Ducrey, Krefting, and others. In doubtful cases it is probable that this cultural method may prove of benefit in reaching a correct diagnosis. Naturally harmless for guinea-pigs, the bacillus may be made harmful by various procedures that diminish the resistance of this animal. Thus antiälexin (anticomplement), by inhibiting leucocytosis and phagocytosis, greatly reduces the immunity of the animal. And lactic acid, presumably by virtue of its repellant action upon leucocytes, renders the bacillus virulent when injected intraperitoneally. In these ways an originally harmless micro-organism is made pathogenic.

BACILLUS PESTIS. Zirolia[4] claims that fleas (P. irritans and serraticeps) when hungry fill themselves with blood, which is immediately squirted out in the neighborhood. This operation may be repeated two or three times. In this way pest bacilli may be scattered about. Zirolia found living pest bacilli in fleas for seven to eight days after the feeding on infected blood.

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[1] Zeitschrift f. Hyg., iii., quoted by Jehle.

[2] Zeitschrift f. Hyg. u. Infektionskr., 1902, xxxix., 1-85.

[3] Annales de l'Institut Pasteur, 1901, xv., 928-940.

[4] Centralblatt f. Bakt., 1902, xxxi., 687.

Toyama[1] exposed cultures of B. pestis to continuous cold for (+ 20° to — 25°C.) three months. The virulence remained unchanged. While proliferative power was reduced at first, it later became even more marked than that of cultures maintained at brood-oven temperature.

Rosenfeld[2] studied the behavior of a number of bacteria in 2 to 5 per cent. salt agar, and found that, while not a few forms result that resemble those taken by B. pestis on salt agar, this bacillus is especially characterized by the large number of yeast-like globules and other swollen forms, so that the method remains a valuable aid to its diagnosis.

Bacillus Mallei. Frothingham[3] reviews his personal experience with the Strauss method of diagnosis of glanders. Strauss, it will be recalled, showed that when glanders bacilli are introduced into the abdomen of male guinea-pigs, peculiar suppurative lesions develop in the scrotal peritoneum. Frothingham uses sterile cotton swabs for collecting the material. The swabs are washed thoroughly in sterile water, suitable small quantities of which are then injected into the abdomen of guinea-pigs, preferably three or four, as he has found that frequently only one of the animals may develop the lesions. When typical lesions develop, numerous more or less isolated suppurative foci appear on the scrotal peritoneum, from which potato cultures should be made. In a large number of tests (horses) he had only four absolute failures.

Bacillus Pyocyaneus. Emmerich, Law, and Korschun[4] claim in opposition to Dietrich[5] and to Klinioff that pyocyanase is a thermostabile ferment, of which group they mention several examples. B. pyocyaneus itself has a similarly high degree of resistance to heat. They show further that the peptonizing ferment of B. pyocyaneus is not identical with the bacteriolytic, or pyocyanase, which they insist is also agglutinating. Dietrich claimed that the bacteriolytic action of pyocyanase is the result of osmotic disturbances, but Emmerich and his coworkers show that the action of pyocyanase is enzymatic because it obeys the general laws of enzymes as to the time for its action and the quantity of material acted upon. The morphological changes of bacteria placed in solutions of pyocyanase differ qualitatively from those observed in isotonic salt solutions. Furthermore, the fact that compounds of pyocyanase with proteids (immune proteidins) are healing and immunizing also speaks in favor of the enzymatic nature of pyocyanase, as does also its destructive action on diphtheria toxin. While most pathogenic bacteria produce enzymes that are bacteriolytic for the single species, B. pyocyaneus produces an enzyme that destroys other bacteria as well, such as cholera, typhoid, diphtheria, and pest bacilli, as well as streptococcus pyogenes and staphylococcus aureus. In the body the enzymes form combinations with proteids (immunproteidins), which are stable, and upon which depend natural and artificial immunity. Dietrich[1] replies, insisting that in the original mixture, called pyocyanade, no one call tell the rôle played by the various factors present—the osmotic action of the salts, the alkalesence, and the ferments and organic substances.

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[1] Centralblatt f. Bakt., Original, 1902, xxxii., 181-185.

[2] Ibid., Abt. I., 1901, xxx., 641-653.

[3] Journal of Medical Research, 1901, vi., 331-340.

[4] Centralblatt f. Bakt., Original, 1902, xxxi., 1-25.

[5] See Progressive Medicine, March, 1902.

Tavernari[2] confirms in a measure the healing effect of Emmerich and Löw's pyocyanase in experimental anthrax.

Petrie[3] denies the claims of Emmerich and Löw that pyocyanase has specific bacteriolytic properties, and, like others, he ascribes the changes observed in bacteria subjected to its action as caused by osmotic and physical forces. He also denies any special virtues on the part of their "immunproteid," which at most may stimulate the "natural defences of the organism" like various other substances.

Margarete Breymann[4] reviews the literature concerning the metabolic products of B. pyocyaneus, and adds the results of a number of personal experiments. She shows that, contrary to the observations of Bulloch and Hunter, the filtrates of pyocyaneus cultures contain hæmolytic substances, which are not destroyed by heat. She also shows that the bacillus contains in its body a ferment which coagulates and peptonizes milk.

Gessard[5] describes a melanogenic form of B. pyocyaneus, the formation of melanin being caused by the ferment tyrosinase present in the bacilli, in the presence of tyrosin in the medium, either free or combined. This demonstration suggests that the production of other pigments by this bacillus also depends upon the action of ferments.

Krause[6] subjected masses of agar cultures of B. pyocyaneus to compression in a specially constructed apparatus giving a pressure equal to 3 to 500 atmospheres. The expressed juice contains a powerful liquefying ferment; it decomposes hydrogen peroxide; not in itself fatally toxic in doses of 3 c.cm., it saves rabbits from fatal anthrax infection when injected intraperitoneally at the same time as the anthrax bacilli are injected subcutaneously. The juice has no such influence on typhoid infection.

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[1] Centralblatt f. Bakt., 1902, xxxi., 165–170. [2] Ibid., 1902, xxxi., 786–793.

[3] Journal of Pathology and Bacteriology, 1902, viii., 200–212.

[4] Centralblatt f. Bakt., 1902, xxx., 481–502.

[5] Annales de l'Institut Pasteur, 1901, xv., 817–831.

[6] Centralblatt f. Bakt., 1902, xxxi., 673–678.

BACILLUS DIPHTHERIA. Anna W. Williams[1] reports extensive investigations regarding the persistence of the varieties of the diphtheria bacillus. She maintains "that not only are there distinct species in this group, but that each species has distinct sub-species or varieties with characteristics that continue to persist under different conditions. Thus, varieties as well as species remain separate, and when grown under similar conditions the species show no tendency to become converted one into the other, while the varieties gradually change, approaching a common norm." This investigator consequently places herself in the ranks of the separatists, which those may be called who hold that there are distinct species of diphtheria bacilli. The important practical conclusion to be drawn from Dr. Williams' work at this time would be "that as many non-virulent diphtheria-like organisms retain their charactistics, under various artificial and natural conditions they may be regarded from the public health standpoint as harmless." The morphological typical diphtheria bacillus is a species distinct from the atypical and pseudo forms. Coming from the research laboratory of the Department of Health, New York City, these conclusions may be regarded as representing the present policy of that service.

Ohlmacher[2] describes some experimental morphological variation of B. diphtheriæ. From an early and still pathogenic culture of a bacillus, which on Loeffler's medium appeared as a long, granular, or barred form (types C. and C_1 of Westbrook), a bouillon subculture was inoculated in a white rat (immune to diphtheria). The serum cultures from the resulting induration showed a plump, uniformly stained rod, like the pseudodiphtheria bacillus. In this case a "typical" diphtheria bacillus had been changed into an atypical one. Gorham has suggested that sojourn in an immune human being may change the granular into the solid type.

In two other instances Ohlmacher describes the transformation of a short solid bacillus (one very virulent, the other less so) into a long granular form by passage through a susceptible animal (guinea-pig).

Funck[3] grew B. diphtheriæ together with an actinomyces and saw alkaline reaction appear earlier in the mixtures than in pure cultures of diphtheria bacilli. The toxicity of the mixed cultures was greater and appeared earlier than in the cultures of bacilli only, but this increased toxicity does not mean increased virulence of the bacillus, but results from alkaline products of the metabolism of the actinomyces, which favor the action of the diphtheria toxin.[1]

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[1] Journal of Medical Research, 1902, viii., 83–108.

[2] Ibid., vii., 128–136. See also PROGRESSIVE MEDICINE, March, 1901, 313.

[3] Journal de Phys. et Path. gén., 1902, iii., 415–419.

Neumann[2] reports five cases of primary diphtheria of the nose without membrane and without involvement of the pharynx or tonsil before, during, or after the attack. The diagnosis was verified by isolation of the bacillus of diphtheria from the nasal secretion and by animal experiments. The symptoms were those of acute simple rhinitis, with very little constitutional disturbance. Neumann believes that primary diphtheria of the nose is more common than generally supposed. His mortality and that of seven other cases collected in the literature is 18 per cent.

Lambotte[3] has applied the method of Bordet and Gengon—*i. e.*, the demonstration of the absence or presence of immune body in a serum—to the study of B. diphtheriæ and B. pseudodiphtheriæ. It will be recalled that immune serum heated to 55° C. for half an hour loses its complement. If it is now mixed with the corresponding organisms suspended in salt solution and fresh normal serum, the microbes under the influence of the immune body absorb the complement of the fresh serum. The presence or absence of complement in a serum is tested by adding to it red corpuscles subjected to the action of specific hæmolytic serum previously heated to 55° C. If the corpuscles are dissolved it means free complement, and hence absence of immune body in the serum tested. Absence of hæmolysis means presence of immune body. Lambotte took 1.2 c.cm. of antidiphtheria serum heated to 55° C., added thereto 0.4 c.cm. of emulsion of diphtheria bacilli, and 0.2 c.cm. normal rabbit's serum. As a control the 1.2 c.cm. of antidiphtheria serum were replaced by 1.2 c.cm. of normal horse serum heated to 55° C. Both mixtures were left at room temperature for six hours. In the meantime the red corpuscles of a chicken are washed in salt solution and suspended in it; a hæmolytic serum (rabbit's) heated to 55° C. is added, and 1 cm. of this mixture is added to each of the foregoing, which are thoroughly shaken and centrifugalized. In both hæmolysis was indicated by the red color of the supernatant fluid. Hence, ordinary antidiphtheric serum does not contain an immune body specific for diphtheria bacilli—a fact not at all surprising when one remembers that immunization is affected by the injection of filtered cultures. On the other hand, immunization of guinea-pigs by injections first of dead and then of living bacilli gives a serum containing immune body specific for diphtheria, as shown by the absence of hæmolysis in mixtures prepared as above. Pseudodiphtheria bacilli similarly injected produced a specific serum. In several experiments with crossed serums and bacilli it appeared that the serums contained the same immune body. Further and more extensive experiments are necessary.

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[1] Maxutow assumes (Centralblatt f. Bakt., 1902, xxxi. 427, Referate) that in the living body the pathogenic organisms grow in virulence because the metabolic products are removed promptly. With this idea in mind he added alkalies to the medium, and found that in that case B. choleræ gallinarum increased materially in virulence.

[2] Centralblatt f. Bakt., 1902, xxxii., 33.

[3] Ibid., 1901, xxx., 817–822.

Guerin[1] has studied avian diphtheria. This disease is caused by a mobile "cocco-bacillus," which does not liquefy gelatin or stain by Gram's method; it does not grow on potato of normal acidity; the pigeon is the most susceptible of the barnyard fowls; it is infected not only by inoculation, but also by ingestion of virulent products. Intraperitoneal inoculations of attenuated cultures (heated) produce an active immunity, and the horse yields an efficacious antimicrobic serum which protects susceptible animals. Animals dead of the disease caused by this bacillus may present a pseudomembranous inflammation of the pharynx with a general bacteriæmia. There may be pulmonary foci, hepatic necroses, and peritoneal exudate. The excrements of such animals are infectious.

BACILLUS TYPHOSUS. Philip Hanson Hiss[2] describes new and simple media for the differentiation of typhoid, colon, and allied bacilli. In simple media[3] of agar, Liebig's extract of meat and distilled water or media differing slightly by the addition of gelatin, sugar, or salt, the typhoid bacillus develops in from twelve to eighteen hours into colonies marked by fringing threads, whereas the colon bacillus grows into larger colonies without threads.

The development of thready colonies of typhoid bacilli in these simple solid media is the feature that makes them valuable for differentiation. Higley[4] used the second formula with success in routine diagnostic work on typhoid feces. In a semisolid medium[5] in tubes the typhoid bacillus grows diffusely with uniform clouding, without gas, while the colon colonies ferment the glucose of this medium with gas formation, and may or may not spread widely from the line of inoculation. Cultures of the intermediate group all produced different colonies than the typhoid in this medium except B. enteritidis, but as all ferment dextrose with evolution of free gas they are easily distinguished from typhoid bacillus. Bacillus dysenteriæ in the simpler agar plate medium forms regular colonies without threads, but varying much in size ; these bacilli do not cause gas in the semisolid medium. It seems to me that this may be a very important step in advance by furnishing simple media for differentiation of the colonies of important organisms that now are being and will continue to be studied extensively in almost every laboratory. Buxton[1] found the colonies of the intermediate organisms on the semisolid medium to resemble typhoid colonies so closely that it became difficult to distinguish between them.

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[1] Annales de l'Institut Pasteur, 1901, xv., 941–952.

[2] Journal of Medical Research, 1902, viii., 148–166.

[3] Some of the formulæ used are: Agar, 15 grammes; Liebig's extract, 5 grammes; distilled water, 1000 c.c. Agar, 15 grammes; Liebig's extract, 5 grammes; NaCl, 5 grammes; dextrose, 10 grammes; and distilled water, 1000 c.c. The latter has been tested thoroughly by Hiss and found very useful in isolating typhoid bacilli from stools.

[4] Medical News, March 29, 1902.

[5] Agar, 5 grammes; gelatin, 80 grammes; Liebig's extract, 5 grammes; NaCl, 5 grammes; dextrose, 10 grammes; distilled water, 1000 c.c.

The Use of Dead Typhoid Bacilli in the Agglutination Test. It may be of practical value to physicians to use formalized bouillon cultures of typhoid bacilli in making the agglutination test. This obviates the keeping alive by regular transplantation of typhoid cultures. The method comes from Ehrlich's laboratory.[2] Twenty-four-hour cultures of typhoid bacilli are killed by adding one part of formalin to 100 parts of culture ; the mixture is allowed to stand for twenty-four hours, when the supernatant homogeneous fluid is poured off and kept as the stock mixture. The test may be made by adding to the same quantity of this mixture various dilutions in physiological salt solution of the suspected serum, either in small test tubes or in small glass cellars. Agglutination is marked by formation of small, crumbling masses, readily seen. Mr. Ruediger in this laboratory has confirmed fully the claims of Proscher in regard to the practicability of this method.

Multiple Agglutinins. Castellani[3] finds that mixed infections do not materially modify specific agglutination, and that in such cases as well as in animals experimentally injected with various agglutinable bacteria, specific agglutinins appear as in single infections or injections. In cases the serum of which agglutinates both typhoid and colon bacilli it may be difficult to determine whether the colon bacillus is present as a mixed infector or not. Castellani recommends that typhoid bacilli be added to the serum in large quantities, and if the serum now loses its agglutinating power upon the typhoid bacillus but not on the colon bacillus it probably means a true, mixed infection. In the case of typhoid fever and the paratyphoid infections the question of secondary and mixed infections may prove to be troublesome (see Libman's case), and the study of multiple agglutinins by the absorption method recommended by Castellani may prove serviceable in certain instances. Specific agglutination has proved of great value in the study of the paratyphoid diseases and the organisms there at work.

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[1] Journal of Medical Research, 1902, viii., 201–230.

[2] Proscher. Centralblatt f. Bakt., 1902, xxxii., 400–403.

[3] Castellani. Zeitschrift f. Hyg. u. Infektionskr., 1902, xl., 33–53.

Bancel[1] studied the agglutinability of seven strains of typhoid bacilli freshly isolated from the blood of typhoid patients. Six of these were less agglutinable than bacilli for some time growing on artificial media. Bacilli isolated from foci of post-typhoid suppuration were not agglutinable at the beginning of their growth on artificial media. It seems that agglutinability develops as the bacillus grows artificially.

Klinger[2] also emphasizes that there occur strains of true typhoid bacilli with relatively low agglutinability—a fact that must be considered in the use of agglutinating serum for the differentiation of bacilli.

E. W. Ainley Walker[3] finds that the serum of horses highly immunized against typhoid bacilli is both protective and curative of typhoid infection in rabbits. In the course of his experiments he saw a disease develop in animals, especially rabbits, which is closely similar to typhoid in man.

Macfadyan and Rowland[4] have studied the intracellular constituents of the typhoid bacillus, which were expressed after trituration of bacilli under special precautions against the development of heat. The injection into animals was followed by the appearance of agglutinins and bacteriolysins in the blood and by protection against lethal doses of typhoid bacilli. Such investigations promise to increase our knowledge of the vital processes of bacteria. At the present time but little is known of the intrabacterial poisons. The work of Vaughan[5] and his pupils at Ann Arbor on the intracellular toxins of colon, anthrax, and diphtheria and other bacilli, is of interest in this connection.

Jehle[6] studied the occurrence of typhoid bacilli in sputum. In cases of typhoid fever complicated with pneumonia bacilli frequently occur not only in the sputum, but also in the infiltrated lung substance. He also found bacilli in the sputum of typhoid patients affected with bronchitis. The bacilli may occur in the sputum for some time after the subsidence of the disease, and it seems not at all unlikely that the sputum may spread typhoid. Further studies of this kind are certainly indicated. Glaser[7] also details cases of pulmonary complications of typhoid fever with typhoid bacilli in the sputum.

Frank W. Lynch[8] reports two instances and reviews the literature on placental transmission of typhoid fever. The resulting condition in the fœtus is bacteriæmia, and the child dies either in utero or soon after birth. In these cases there generally are present placental hemorrhages. The agglutinating reaction may be absent even when bacilli have entered the fœtus, and the source of fœtal agglutinins cannot be determined because they may have entered from the maternal blood.

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[1] Journal Phys. et Path. gén., 1902, iv., 519–526.

[2] Centralblatt f. Bakt., 1901, xxxii., 542–553.

[3] Journal of Pathology and Bacteriology, 1901, vii., 375–387.

[4] Centralblatt f. Bakt., 1900, xxx., 753–760.

[5] Journal of the Michigan State Medical Society, 1902; abstract in the Journal of the American Medical Association, 1902, xxxix., 1213. The full publications occur in the Transactions of the American Physicians, 1902, xvii., 242–331, and more extended notice of the results there recorded is reserved for some future occasion.

[6] Wiener klin. Wochenschrift, 1902, No. 9.

[7] Deutsche med. Wochenschrift, October 30, 1902.

[8] Johns Hopkins Hospital Reports, 1902, x., 282–322.

Much has been done during the past year or two upon the bacteriology of the blood in typhoid fever. From the investigations of Castellani,[1] Auerbach and Unger,[2] Cole,[3] Hewlett,[4] Caumont,[5] Schottmüller,[6] Kerr and Harris,[7] and others, it has been shown that bacilli are demonstrable easily in the blood of between 80 and 90 per cent. of unselected cases. Schottmüller's investigations cover 100 cases, and he has demonstrated the bacillus in the blood as early as the second day of the disease and in the first twenty-four hours of relapses after two to three weeks of complete intermission in the fever. Hence there is no doubt but that bacillæmia is a more dominant feature in the pathogenesis of the disease than heretofore believed. All workers agree that the diagnostic value of this method is greater in the initial stage of an attack than the reaction of agglutination, and Schottmüller, whose technique differs from that mostly employed (large quantities of fluid media), in that he uses agar plates made with blood, and thus is able to count the colonies, believes the number of bacilli bears a relationship to the height and severity of the disease. He suggests that while the bacillus, no doubt, enters the blood from the intestines, yet the intestinal lesions proper are explainable easily as the result of hæmatogenous invasion. It seems to me that the establishment of typhoid fever as a bacteriæmia from the beginning will aid us materially in explaining the development of the microscopical lesions of the disease. B. typhosus produces hæmolytic substances, and its presence in the blood may be conceived as favoring their production in large quantities in response to substances in the body of the patient, and, as pointed out elsewhere in this review, hæmolysins appear to stimulate the production of macrophages in the spleen and elsewhere; in typhoid lesions the number of proliferated endothelial cells containing red corpuscles and lymphocytes is so great as to suggest that factors of this kind are at work. Toxins of the typhoid bacillus should be carefully studied by the newer methods used in cytotoxic work.

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[1] Centralblatt f. Bakt., 1902, xxxi., 477–478 (abstract).

[2] Deutsche med. Wochenschrift, 1900, 706.

[3] Bulletin of Johns Hopkins Hospital, 1901, xii., 203.

[4] Medical Record, 1901, lx., 22.

[5] Journal de Phys. et Path. gén., 1902, iv., 155–170.

[6] Münchener med. Wochenschrift, 1902, xlix., 1561–1565.

[7] Chicago Medical Recorder, 1902.

Polacco and Gemelli[1] obtained the remarkable result of pure cultures of typhoid bacilli from the rose spots in every one of fifty cases of typhoid fever. In many instances this result was obtained before agglutination. They used fluid media and inoculated a little of the tissue as well as the blood from the rose spots. Seemann[2] recommends bacteriological examinations of rose spots as a good diagnostic procedure in typhoid fever.

Another important and interesting aspect of the bacteriological study of the blood in typhoid fever is the repeated demonstration in the blood of patients with more or less typical typhoidal symptoms of so-called paratyphoid bacilli—bacilli that in some biological respects differ from the typical typhoid bacillus.[3] Cases of this kind are described by Buxton and Coleman,[4] Libman,[5] Brion and Kayser,[6] Johnston,[7] Hewett,[8] and Longcope.[9] In these cases the agglutination test was found indispensable in differentiating between the bacilli that had to be considered. Meltzer[10] has given a good review of this subject of paratyphoid. The value of bacteriological examination of the blood of cases of suspected typhoid not giving typical agglutination of typhoid bacilli lies in the fact that paratyphoid bacilli may be isolated and studied. During the typhoid epidemic in Chicago last fall Mr. Ruediger, in a small series of cases from the Presbyterian Hospital, in this way ran across two cases of paratyphoid. Where bacteriological examination of the blood is not possible or the results negative the blood of such patients should be tested with paratyphoid bacilli for the presence of specific agglutinins as in two cases described by Johnston.

Libman[11] describes a case of "paracolon" infection which was probably secondary to typhoid fever, the patient's blood giving a specific reaction with both the typhoid bacillus and the paracolon bacillus. There were healing ulcers in the ileum, but on account of the complicated nature of the case, which is thoroughly and interestingly discussed by Libman, it is not possible to say whether intestinal ulcers are characteristic of the intermediate groups or not.

Longcope reports another fatal case that must be regarded as an uncomplicated paratyphoid infection. Here there was absence "not only of ulcers, but of marked microscopic lesions in the intestine;" the mesenteric glands and spleen were free from endothelioid proliferation, thus showing that paratyphoid bacilli may produce fatal infections distinct from typhoid fever.

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[1] Centralblatt f. innere. Med., 1902, xxiii., 121.

[2] Wiener klin. Wochenschrift, 1902, xv., 580–581.

[3] See PROGRESSIVE MEDICINE, March, 1901, p. 319, for Cushing's summary of distinguishing characteristics of typhoid, colon, and Gärtner on intermediate groups.

[4] American Journal of the Medical Sciences, 1902, cxxiii., 976–990.

[5] Journal of Medical Research, 1902, vii., 168–200.

[6] Münchener med. Wochenschrift, April 15, 1902.

[7] American Journal of the Medical Sciences, 1902, cxxiv., 187–200.

[8] Ibid., 200–209.

[9] Ibid., 209–218.

[10] New York Medical Journal, 1902, 138–142.

[11] Journal of Medical Research, 1902, viii., 168–200.

Lion and Negel[1] also isolated an organism of this class from the blood of a case of typhoid-like fever that terminated fatally. Here, also, there were absent the usual anatomical changes of typhoid fever, both in the intestines and the lymph glands. The general anatomical picture was that of a severe infection. The spleen was large. They describe at length a small series of cases of paratyphoid, tracing the infection to water.

Buxton[2] presents a thorough comparative study of the intermediate bacilli. Buxton suggests that the organisms be divided into the paracolon group, which does not produce typhoid symptoms in man, and into the paratyphoid group, which causes typhoidal symptoms. In the last are two distinct species, one culturally resembling the paracolon, one not.

Hünermann[3] describes an epidemic of thirty-eight cases apparently caused by a paratyphoid bacillus that causes fermentation in glucose, but no change in milk. The blood serum of nineteen cases agglutinated this bacillus in a dilution of 1 : 1000 to 1 : 2000.

Julius Appel[4] describes a case of bacteriuria, the urine containing enormous quantities of a typhoid-like bacillus. It is thought that infection occurred by way of the urethra with localization in the prostate. The patient had not had typhoid fever.

ANAEROBIC ORGANISMS. Eugene Fraenkel, who first showed the relation of the gas bacillus (*bacillus phlegmonis emphysematosus, bacillus aërogenes capsulatus*) to gaseous phlegmons and emphysematous gangrene, reviews[5] certain aspects of the investigations that have appeared since then (1893). Grassberger and Schattenfroh have claimed that the *gas bacillus* is a pathogenic sub-variety of their butyric acid bacillus (*granuolobacillus saccharobutyricus immobilis*), but Fraenkel cannot agree to this, because the gas bacillus proper does not, like the *butyric acid bacillus,* produce spores in starch agar.

Fraenkel found that in a case of gas bacillus infection following a crushing injury, numerous foci of leucocytic infiltration, extensive disintegration of muscular tissue, with karyolysis and other changes, may develop in the short space of a few hours. Lindenthal and Hitschmann claim that in pure gaseous phlegmons inflammation is wholly absent, the changes being produced after death. In experimental gas phlegmons in guinea-pigs there also develop areas of cellular infiltrations. Fraenkel emphasizes the vital nature of the process as shown by these inflammatory changes. From suitable human material and by experiment he has satisfied himself that in dead tissue the bacillus produces only gas. And the changes in the so-called "foaming organs" indicate that here also it concerns a post-mortem invasion, because of the absence about the gas holes of all signs of vital reactions.

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[1] Centralblatt f. Bakt., 1902, xxxii., 483–488, 581–596, 679–692.

[2] Journal of Medical Research, 1902, viii., 201–230.

[3] Zeitschrift f. Hyg. u. Infektionskr., 1902, xl.

[4] Ibid., 1901, xxxviii., 355–371.

[5] Ibid., 1902, xv., 73–102.

Repeated intraperitoneal injections of dogs with cultures of the gas bacillus seem to produce some immunity to local subcutaneous injections, and the serum of dogs so treated appears to have some protective action in guinea-pigs.

Cole[1] demonstrated B. aërogenes capsulatus in the blood during life of a patient with infection and gas formation in the stumps produced by a crushing injury of the lower extremities. There was no gas in the blood during life.

Albrecht[2] and Stolz[3] present extensive studies of the bacteriology of *gaseous gangrene*. In Albrecht's series the evidence indicated that fresh surgical wounds were infected by way of the air. Most of the cases were mild, the infection being uncomplicated with other forms than gas-producing bacilli. In most of the cases it concerned the gas bacillus of Welch and Nuttall. Mixed infection with gas bacilli and pyogenic cocci produced more closely the features of emphysematous gangrene. In two cases the organism present corresponded more closely to a butyric acid bacillus described by Schattenfroh and Grassberger. Stolz and von Wickler also describe cases caused by a motile butyric acid bacillus. Both Albrecht and Stolz conclude that in man the malignant œdema of Koch and the early bacteriologists in most cases was the result of the entrance of gas-producing bacilli, especially the Fraenkel-Welch bacillus.

Achalme[4] regards the bacillus described by him in 1891 as the cause of *acute articular rheumatism*, the gas bacillus of Welch, Fraenkel's bacillus emphysematosus, Klein's B. enteridis sporogenes, and Veillon and Zuber's B. perfringens as the same organism. He likens its pathogenic action to that of the streptococcus, which causes a specific disease, namely, erysipelas as well as a number of non-specific processes. So, also, this anaërobic organism causes a specific disease, namely, acute articular rheumatism, and, further, a variety of other lesions. This bacillus belongs to a group of organisms characterized by anaërobic growth; spore-formation in alkaline media; liquefaction of gelatin; tryptic action on casein, fibrin, and albumin; fermentation of carbohydrates with the production of acetic and butyric acids (bacillus anaërobes trypto-butyriques).

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[1] Bulletin of Johns Hopkins Hospital, 1902, xiii., 234–235.

[2] Archiv f. klin. Chirurgie, 1902, lxvii., 514–586.

[3] Beiträge z. klin. Chirurgie, 1902, xxxiii., 72–136.

[4] Annales de l'Institut Pasteur, 1902, xvi., 641–662.

Hitschmann and Lindenthal[1] describe eight cases of "schaumorgane," in all cases of which they found the same bacillus—an anaërobic Gram-staining organism—which is not motile and forms spores; it ferments carbohydrates and proteids with abundant formation of hydrogen, and is pathogenic for guinea-pigs and mice. The gas formation may occur from a postagonal invasion or secondarily to "gangrene foudroyante." The foci of gas—fermentation necrosis—in the organs are marked by absence of nuclei and presence of these bacilli. The authors also attribute vital emphysema of the vaginal and other mucous membranes, often associated with giant-cell formation, to the same bacillus.

Sandler[2] believes with Hitschmann and Lindenthal that gaseous gangrene with suppuration is a mixed infection. In pure cases there develop necrosis and gas.[3]

Bacillus Tetani. Symanski[4] succeeded in demonstrating the presence of tetanus toxin in the blood of the decomposed cadaver exhumed thirty-six days after death from tetanus. The blood was filtered through infusorial earth and the filtrate injected in varying doses in mice. Doses of 1 c.cm. and 0.5 c.cm., respectively, produced fatal tetanus; thus, it has been shown that it may be possible to demonstrate the presence of tetanus toxin some time after death under circumstances that prevent the isolation of B. tetani.

Tuberculosis. Tubercle Bacilli and Allied Forms. The most actively discussed question in connection with tuberculosis continues to be the identity or non-identity of the bacilli of human and bovine bacilli. On the whole, the trend of opinion as influenced by the results of recent investigations seems to be opposed to Koch's claims as to the harmlessness for man of the bacilli of bovine tuberculosis, but as this phase of the matter is discussed fully elsewhere in Progressive

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[1] Centralblatt f. Bakt., 1902, xxxi., 201–202 (abstract).

[2] Ibid., xiii., 471–483; see also a general review of the subject by the same author, Ibid., 484–512.

[3] Concerning aërobic gas-producing bacilli, see Uffenheimer, Ziegler's Beiträge, 1902, xxxi., 383–418; Gohn, Centralblatt f. Bakt., 1902, xxxi.; Westenhäffer, Virchow's Archiv, 1902, clxviii., 186–232.

[4] Centralblatt f. Bakt., 1901, xxx., 976–978.

MEDICINE, I shall not attempt any review of the numerous recent publications dealing with it.[1]

The quintessence of Behring's recently published, most elaborate, and, it seems, epochal investigations (Behring, Römer, and Ruppel, *Beitr. z. exp. Therapie*, 1902, Heft 2), in regard to tuberculosis is the demonstration that it is possible to immunize cattle against an infectious tubercle bacillus. Influenced by Koch's teaching of the quality of the bacilli of human and bovine tuberculosis, Behring turned his attention to the study of bovine bacilli and soon secured races of bacilli of such extraordinary virulence that the intravenous injection of 2.5 mg. kills cattle in two or three weeks from acute miliary tuberculosis of the lungs. And then he finds that the preliminary treatment of cattle with human bacilli that do not cause fatal results in cattle produce in four weeks full immunity against the highly virulent bovine bacilli. Behring designates this form of vaccination as "jennerization." This result must be held as one of fundamental importance in the study of immunity to tuberculosis. By passing a human bacillus through rabbits and goats, Behring saw an increase in virulence for cattle, so that there no longer was any difference in this respect between the human and bovine bacilli. For this reason Behring finds himself compelled to abandon Koch's dualistic theory and to regard human and bovine bacilli as presenting simply differences in virulence, and to accept the practical possibility of mutual infection. The further fact that it is possible to immunize cattle with human bacilli would seem to place the doctrine of unity in regard to bacilli of human and bovine tuberculosis upon a firm basis. Behring places little value upon the serum reaction for tuberculosis as elaborated by Arloing and Courmant. Ludwig Loeb,[2] from a careful study in our laboratory of the agglutination of homogeneous cultures by serums of various kinds, reached these conclusions:

1. Under various conditions animal sera agglutinate homogeneous cultures of human tubercle bacilli in liquid media.
2. Such sera may be obtained from the human or animal body without the presence in it of the bacillus tuberculosis.
3. It is doubtful whether the agglutinative powers are ever due to the specific action of the bacillus tuberculosis.
4. The presence or the absence in the adult human blood serum of agglutinative properties for tubercle bacilli is no evidence of the presence or absence of tuberculous lesions in the body.

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[1] For exhaustive discussions of this question, see Ravenel, Proceedings of the Philadelphia Pathological Society, 1902, v., 182-226; and v. Szekely, Centralblatt f. Bakt., Ref., 1902, xxxii., 167-173, 194-203, 225-237.

[2] Transactions of the Chicago Pathological Society, 1902, v., 141-145.

Nicolas and Descos[1] fed dogs soup containing tubercle bacilli, and recovered bacilli from the chyle vessels and the thoracic duct, showing that tubercle bacilli may penetrate the intact mucous membrane. Manfredi[2] reports upon experimental studies of the protective action of lymphatic glands against tuberculosis.

Carriere[3] studied the action of various ferments upon the toxins of the tubercle bacillus. He subjected bouillon cultures to the action of ptyalin, pepsin (and HCl), trypsin, and bile for forty-eight hours, when the mixtures were filtered through Chamberland cylinders and various experiments made with the filtrates and the cultures. He found that all these substances extract toxic substances from the bacilli. These substances are equally toxic for healthy and tuberculous animals, and do not exercise curative or immunizing actions. The bacilli of the cultures treated as indicated with trypsin were extracted with toluol; the substance was less toxic than toluol extract of bacilli not treated with trypsin; it had no curative or immunizing properties.

Arloing and Descos[4] examined tuberculin as to the presence in it of toxones and their influence upon experimental tuberculosis. It will be recalled that according to Ehrlich's theory toxones have the power to cause the formation of antitoxin, although they are much less harmful than the toxins, but the toxones are not neutralized by antitoxin as readily as the toxins. By mixing tuberculin and antituberculin, Arloing and Descos neutralized tuberculin while the toxones remained free, but they found by experiments that this mixture gave no better results than the tuberculin or antituberculous serum alone and at the same time the toxones were found to possess a real toxicity in so far as they favor the development of experimental tuberculosis.

E. A. de Schweinitz and Dorset[5] report upon the chemical composition of tubercle bacilli obtained from various sources.

Histogenesis and Histology. According to James Miller,[6] the *hæmatogenous tubercle of the liver* begins with an accumulation of intravascular and perivascular leucocytes, while the first changes in the fixed cells are swelling and desquamation of the endothelial cells of the capillaries. The endothelial cells form the epithelioid cells and giant cells of the tubercle; the giant cells result first from the coalescence of endothelial cells, and the liver cells do not play an active rôle in the development of the tubercle.

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[1] Journal de Phys. et Path. gén., 1902, iv., 910-912.

[2] Centralblatt f. Bakt., Ref., 1902, xxxii., 295-306.

[3] Archiv de Med. exp. et d'Anat. path., 1901, xiii., 729-772; also Compt.-rend. de Soc. de Biol., 1901, liii., 1098-1099.

[4] Journal de Phys. et Path. gén., 1902, iv., 139-154.

[5] Centralblatt f. Bakt., Original, 1902, xxxii., 186-192.

[6] Ziegler's Beiträge, 1902, xxxi., 347-364.

Watanabe[1] studied the action of tubercle bacilli introduced into the trachea of rabbits. There results, first, a desquamation and swelling of the epithelial cells of the bronchi and the alveoli, followed or accompanied by serous exudation and immigration of polynuclear leucocytes. Later tissue proliferation sets in. He also traces giant cells to the coalescence of cells.

Armand-Delille[2] made an experimental study of the meningeal changes produced in dogs by the injection of ethereal and chloroform extracts of human tubercle bacilli, and found that the changes are strictly comparable to those observed in chronic tuberculous meningitis. The symptoms produced were analogous to those of a pachymeningitis and leptomeningitis of tuberculous nature.

At the fourth annual meeting of the German Society of Pathologists this subject received considerable attention. Baumgarten and Orth reviewed the changes produced in tissues by the bacillus. The address of the former is remarkable for its conservatism, that of the latter for its breadth of view. It was pointed out that the opinion of the Metchnikoff school, that the tubercle has its origin in leucocytes, has found few adherents ; both accept the view that the " epithelioid " cell may be derived from free epithelium, although Orth considers this origin less frequent than usually assumed. The genesis of the " lymphoid " cell is still traced to leucocytes, and divergent views are held concerning the reticulum ; for some it is a product of coagulation, for others the remains of pre-existing tissue. Baumgarten reiterated his belief that the primary effect of the bacillus is to initiate proliferation, and accounted for the retrogressive changes in early tubercles observed by Wechsberg, a pupil of Weigert, the chief opponent to this dogma, by the circulating disturbances incidental to the technique employed.

There is a distinct tendency to replace the teteological conception of the giant cell as a phagocytic product, by a mechanical explanation of its origin from cessation of proliferation. Baumgarten emphasized the rôles played by the number of bacilli, their virulence, and the element of time in the character of the lesions produced. Orth maintained that the bacillus alone may cause lesions that are purely necrotic, exudative, or proliferative ; that tuberculosis in man and animals is the same disease ; further, he has demonstrated the destruction of elastic fibres in tuberculous granulation tissue and their integrity in the caseation of tuberculous pneumonia. Baumgarten showed specimens of experimental tuberculosis of the lungs resembling the ulcerative tuberculosis with cavities ordinarily encountered in phthisis ; they were found in the course of experiments to determine the methods of extension of genito-urinary tuberculosis. Aufrecht did not gain a favorable reception for his belief that pulmonary tuberculosis is usually hæmatogenous. It was strongly urged that the racial peculiarities of the bacillus be studied, as well as the changes produced by the toxins.[1]

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[1] Ziegler's Beiträge, 1902, xxxi., 367-382.

[2] Archiv de Med. exp. et d'Anat. path., 1902, xiv., 277-296; also Compt.-rend. de Soc. de Biol., 1901, liii., 885-887.

Baumgarten[2] does not accept any real distinction between caseous pneumonia and miliary tuberculosis of the lungs. Caseous pneumonia is not merely a superficial intra-alveolar exudation, and pulmonary tubercle is not merely an interstitial interalveolar proliferation, the difference between the two being largely quantitative; both processes outlined occur to some degree in each of these forms of tuberculosis.

Sprecher[3] reports an extensive study of the peculiar inclusions in giant cells found in certain cases of tuberculosis, especially of the skin. He is of the opinion that these bodies are produced by a slow, regressive metamorphosis in the protoplasm of the cells associated with calcareous and ferruginous incrustations. His efforts to obtain the reactions for elastin and elacin failed, and he could prove in no case any connection between the inclusions and extracellular elastic fibres.

Acid-proof and Alcohol-proof Bacilli. The observations of the occurrence of the so-called "tuberculoid" bacilli are multiplying rapidly, and the repeated demonstration of such organisms under circumstances in which they easily might be confounded with tubercle bacilli shows that care must be taken lest on this account serious mistakes be made in clinical diagnosis.

W. Ophüls[4] in five cases of *pulmonary gangrene* found bacilli, long and slender, with irregularly staining protoplasm, often in clusters, and in every case some forms showing true branching. Stained with carbol-fuchsin the bacilli were decolorized in acid alcohol, but not in aqueous solutions of sulphuric acid (12.5 per cent.). Successful cultures were not secured. Ophüls refers to the literature of acid-proof bacilli, and discusses the probable relation of the latter to pulmonary gangrene without being able to reach definite conclusions.

Folli,[5] in six cases of gangrene, found acid-proof tuberculoid bacilli that were decolorized by tartaric acid. Mayer,[6] in ten cases of supposed tuberculosis, found acid-proof and alcohol-proof more or less branching forms in the sputum. Cultures were obtained of one form.

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[1] Verhandl. d. path. Gesellsch., 1901, iv.

[2] Deutsche Archiv f. klin. med., 1902, lxxiii.

[3] Archiv per le Sc. mediche, 1902, xxvi., 79-105.

[4] Journal of Medical Research, 1902, viii., 242-254.

[5] Riforma medica, August 27, 1901, abstract in Centralblatt f. Bakt., Ref., 1902, xxxii., 290.

[6] Centralblatt f. Bakt., Ref., 1902, xxxii., 290.

Lichtheimer[1] cultivated from the sputum a tuberculoid bacillus which was acid-proof but not alcohol-proof. Olschanetzky[2] found a similar but pleomorphic and branching bacillus in an hepatic abscess in a rat. It was pathogenic for rats. Lichtenstein[3] found similar acid-proof bacilli in a case of fibrinous bronchitis. Ohlmacher[4] also describes an atypical acid-proof and alcohol-proof fungus from a case clinically resembling tuberculosis of the lungs. The acidophile bacteria are studied monographically by Potet,[5] who calls them paratubercle bacilli.

Cahn[6] describes in detail the bacillus acidophilus of the stool.

Moeller[7] claims to have isolated the real *smegma bacillus* in pure culture by means of streaks on glycerin agar plates. It is an absolutely and permanently alcohol-proof and acid-proof organism which grows on the ordinary media and is without pathogenic action.

Barannikow[8] states that the inoculation of guinea-pigs with the preputial smegma of healthy persons and of animals gives the same results as that of tuberculous sputum, including general miliary tuberculosis. As he gives no exact details it is sufficient to note that this is contrary to the observations of Moeller and others.

Armand-Delille[9] produced nodules in the pia mater of the dog not unlike those of tuberculosis by injecting the *timothy bacillus* of Moeller into the subdural space. Similar lesions are caused by an ethereal extract of the bacilli.

Hölscher[10] completes his experimental study of the acid-proof tuberculoid bacilli (Rabinowitch's butter bacillus, Moeller's grass bacillus, and timothy bacillus) by a report of the histological changes. He finds that these bacilli lead to the production of Langhans' giant cells and of nodules of a peculiar structure. While the lesions so far resemble tuberculosis, the termination is different; in tuberculosis caseation, in case of the tuberculoid bacilli, suppuration or organization. In tuberculosis the process may become generalized from a local focus, while the tuberculoid organisms act more like inert foreign bodies, and exercise essentially a local effect, with little or no dissemination. The resistance to acid, the power to form actinomyceloid masses, and to produce giant-cells and nodules nevertheless indicate a close relationship between these three forms and the bacillus of tuberculosis. Whether it is ever interchangeable cannot be surmised.

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[1] Deutsche med. Wochenschrift, 1902, No. 13.

[2] Centralblatt f. Bakt., 1902, xxxi., 16-21. [3] Ibid., 1902, xxxii., 290.

[4] Transactions of the Chicago Pathological Society, 1901, v.

[5] Lyon, A. Rey & Co., 1902, 219 pages.

[6] Centralblatt f. Bakt., Abt. I., 1901, xxx., 721-726.

[7] Ibid., 1902, xxxi., 280-282. [8] Ibid., 1902, xxxi., 282-285.

[9] Compt.-rendu. de Soc. de Biol., 1902, liv., 887-889.

[10] Arbeiten aus Baumgarten's Institut., 1902, iv., 21; also in Münchener med. Wochenschrift, 1901, xxvii., 1483.

Abbott and Gildersleeve[1] describe actinomyces-like formation in the tissues of some of the acid-proof bacilli injected intravenously (Moeller's grass bacillus, Moeller's timothy bacillus, and Rabinowitch's butter bacillus). The authors are inclined to group B. tuberculosis, which also, under certain conditions, produces ray fungus forms in the tissue (see references to the original articles on this topic in PROGRESSIVE MEDICINE, March, 1900, pp. 322-328; March, 1901, p. 322, and March, 1902, pp. 313-327), and these acid-proof bacilli as belonging to the genus actinomyces.

Moeller[2] shows by experiments that the acid-proof pseudotubercle bacilli and the human tubercle bacilli produce like changes in calves when injected with butter. Injected alone neither produce any lesions. Sato and Brauer[3] reached similar results with the Petri-Rabinowitch butter bacillus.

PSEUDOTUBERCULOSIS STREPTOBACILLOSA. Aschoff[4] describes an extensive nodular disease in a newly born infant. The nodules contained large masses of bacilli, which he isolated in pure cultures and which the experimental inoculations proved is closely related if not identical with the bacillus of pseudotuberculosis of rodents as it produces characteristic nodules in the organs of mice, guinea-pigs, and rabbits. The resulting nodules like those in the child stand midway between abscess and epithelioid tubercles with central necrosis and extensive karyorrhexis. Sometimes the cells are loaded with bacilli. Presumably the child was infected by aspiration. Henle has described similar nodules in newborn twins, and Aschoff refers to four cases of human pseudotuberculosis in the literature.

CULTIVATION OF THE BACILLUS LEPRÆ. Van Houtum[5] cultivated from bacillus-laden leprous tissue a bacillus that differs from Hansen's bacillus lepræ in size and staining. This bacillus undergoes lysis in dilute human serum, and more markedly in leper than in non-leper serum. By experiments Van Houtum concludes that the leper serum contains a specific intermediary body, while the bacteriolytic action of normal serum is due only to complements. For this reason he regards the bacillus grown by him as the true cause of leprosy, because leper serum alone would contain specific intermediary body (amboceptor) for the organism. In the event that this work is confirmed we have here a good example of the diagnostic value of specific amboceptors. It is not certain, however, that the bacillus Van Houtum has isolated is the bacillus of leprosy, because it may be some form of skin bacterium that finds specially favorable conditions for development in leprous skin. The demonstration would have more value if the bacillus had been obtained from some internal organ.

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[1] Centralblatt f. Bakt., 1902, xxx., 547-550; also University of Pennsylvania Medical Bulletin, 1902, xv., 106-126.

[2] Deutsche med. Wochenschrift, 1902, xxviii., 466-468 and 483-485.

[3] Zeitschrift f. Fleischr. u. Milchhyg., 1901, Band xii., 11.

[4] Verh. deut. path. Gesellsch., 1901, iv., 178, 186.

[5] Journal of Pathology and Bacteriology, 1902, viii., 260-275.

Pathogenic Fungi. ACTINOMYCES. W. G. MacCallum[1] describes an interesting case of diffuse peritonitis caused by *actinomyces asteroides.* (MacCallum very properly points out that, according to the law of priority in bacterial nomenclature, the generic name actinomyces must be used for all the species of the group concerned, many of which are designated as streptothrices. This is the position I have urged in the two previous issues of PROGRESSIVE MEDICINE.) Actinomyces asteroides was described first by Eppinger, who found it in a cerebral abscess. MacCallum's case of peritonitis probably is the only additional case known of this infection in the human body, except, perhaps, the case of Aoyama and Migamato.[2] It concerns a branching filamentous organism staining irregularly and producing coccus-like vegetative bodies at the ends of certain hyphæ. Inoculation in rabbits is followed by the production of characteristic ray fungus forms, which in this species consist of elongated cylindrical structures with laterally radiating clubs, the exact nature of which MacCallum does not venture to determine. The organism is strikingly pathogenic for laboratory animals, producing disseminated focal lesions beginning with necrotic or degenerative changes, leucocytic accumulation, and necrosis, followed by the formation of a capsule of granulation tissue in which giant cells occur.

Foulerton and Price Jones[3] discuss the general characteristics and the pathogenic action of the genus actinomyces (for which they prefer to use the term streptothrix). They examined twenty-five species, among them being four new ones, one of which is probably pathogenic. It was isolated from the pus of a case of acute conjunctivitis with sloughing of the cornea, but it is not pathogenic for rabbits, guinea-pigs, or tame mice (streptothrix-actinomyces-luteola). The other three are saprophytic.

Birt and Leishman[4] describe a new acid-fast actinomyces, pathogenic to man and animals, and isolated from a fatal case of lung disease and pericarditis in man, in whom the clinical diagnosis of pulmonary tuberculosis was made. The branching forms seen in the sputum during life were regarded as branching tubercle bacilli; numerous acid-proof rods were also present in the sputum. The organism was first obtained from pus in the right pleural cavity and after death from nodules in the left lung, from the empyema pus, and from serofibrinous pericardial exudate. The right lung is described as in a condition of chronic bronchopneumonia, but free from nodules or cavities, while the left lung contained small cirrhotic nodules differing from miliary tubercles and without caseation. The organism is branching, sporogenic, aërobic, non-liquefying, presenting dry, powdery growth on agar and potato, at first white, later coral-pink, and non-adherent. In bouillon isolated rosettes develop, the fluid remaining clear. Milk is coagulated. There is no growth on solid blood serum. In guinea-pigs the fundus produces accumulations of caseous matter and death in five to six weeks.

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[1] Centralblatt f. Bakt., 1902, xxxi., 529–547.

[2] Ibid., 1901, xxix., 262, 263.

[3] Transactions of the Pathological Society of London, 1902, liii., 55–127; see also Price Jones, ibid., 1900, li.

[4] Journal of Hygiene, 1902, ii., 120–128.

Feistmantel[1] gives a number of details concerning *actinomyces farcinieus.*

OIDIUM (BLASTOMYCES).[2] Howard T. Ricketts has published a valuable and in some respects exhaustive study of blastomycetic dermatitis and its organisms,[3] which he carried on in our laboratory at Rush Medical College upon material from the dermatological clinic of Professors Hyde and Montgomery. The conclusions that seemed to be warranted by this work are as follows :

1. The so-called protozoic disease of Posadas, Wernicke, and others ; Busse's and Curtic's saccharomycosis hominis ; and Gilchrist's blastomycetic dermatitis are various manifestations of the same disease.

2. The condition in the skin possesses constant clinical and histological characteristics, which separate it positively from all other skin diseases, particularly verrucous tuberculosis, carcinoma, and syphilis.

3. The organisms isolated from various cases differ in minor respects among themselves, but are so closely related morphologically and biologically as to justify their inclusion in a common genus, oïdium ; they are thus analogous in a pathogenic sense to the fungi which cause actinomycosis and to those causing trichophytosis.

4. The variations among the organisms allow the recognition of three morphological types : (*a*) Blastomycetoid or yeast-like ; (*b*) oïdium-like ; (*c*) hyphomycetoid.

5. There are two histological forms of the disease in the skin—the eosinophilous and the non-eosinophilous—the former being associated with the mould type of the organism.

6. In accordance with conclusion 3, oïdiomycosis is an appropriate term for the conditions caused by the organisms, and oïdiomycosis cutis for the disease as it occurs in the skin.

7. Aside from the infections considered in this communication, cer-

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[1] Centralblatt f. Bakt., 1902, xxxi., 433–445.

[2] See PROGRESSIVE MEDICINE, September, 1902, 149.

[3] Journal of Medical Research, vi., 374–547.

tain cases which have been described in the literature from time to time indicate that oïdium-like organisms may cause other severe pathological conditions in man.

It seems to me that Kromayer's[1] criticism of the American work on blastomycetic affections of the skin is too narrow, and for some reason so evidently prejudiced that serious answer would be unwarranted.

Joseph D. Weiss[2] worked over the blastomycetes of Sanfelice, Plimmer, and others according to Klöcker's classification, which is accepted by the Danish authorities, Hansen and Jorgensen. Weiss concludes that these blastomycetes are torulæ.

Sternberg[3] made an experimental study of the lesions produced in animals by some fifteen blastomycetes (oïdia and yeasts). He divides his organisms into oïdia and yeasts (blastomycetes, saccharomycetes), the former being characterized especially by the formation of threads. In the first Sternberg follows Cao. Three of Sternberg's organisms produced threads in the tissues of the animals injected, oval and budding forms being less common. They are grouped as oïdia and produce especially acute processes, frequently with foci of round-cell infiltration, but sometimes the threads grow in the tissues without any reaction on the part of the latter. With some of the yeasts used he obtained quite enormous localized "pseudotumors," composed of pure growths of the organisms.

Sanfelice[4] demonstrated the presence of specific antibodies in the serum of various animals immunized with blastomycetes attenuated by heat. He claims that the blastomycetic properties of the serum of immunized animals change the parasites in the organism so that they appear like Russell's fuchsin bodies. Antibodies were not found in animals with active blastomycetic infection. Perhaps this aspect of blastomycosis has not been sufficiently studied as yet.

Denecke[5] describes an interesting case of inflammation and proliferation of Meckel's diverticulum followed by circumscribed but fatal peritonitis. The bacteriological examination showed only branching threads with conidia; the wall of the diverticulum was infiltrated with such organisms. Cultures showed that it concerned a typical oïdium which was pathogenic for various animals.

Denecke's[6] organism exists as yeast-like cells in bouillon, occasionally growing out to form septate threads mixed with conidia. In agar the growths consisted only of conidia. In gelatin clusters of conidia develop about the threads and their branches. Dextrose, levulose, maltose, and lactose are fermented, but not saccharose.

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[1] Centralblatt f. Bakt., 1902, xiii., 531–532.

[2] Journal of Medical Research, 1901, vii.

[3] Verh. d. path. Gesellsch., 1902, iv., 161–165; the complete article occurs in Ziegler's Beiträge, 1902, xxxii., 1-105.

[4] Centralblatt f. Bakt., Original, 1902, xxxii., 360–365.

[5] Deutsche Zeitschrift f. Chir., 1902, lxii., 548.

[6] Ibid., 548–565.

I. D. Haan[1] describes a disease in horses due to a hyphomyces and occurring either as a nodular disease in the skin and subcutaneous tissue or of the nasal and oval mucous membranes. It spreads through the tissues regardless of their nature, and there form large plugs of a grayish-yellow color, consisting of hyphomycelial masses. The fungus was cultivated on agar. The disease is named *hyphomycosis destruens equi*. A similar disease is described by Strong among horses in the Philippine Islands (Manila, 1902).

Frothingham[2] describes a tumor-like nodule in the lung of a horse caused by a blastomyces, which obtained in pure cultures produced similar lesions in rabbits and guinea-pigs as did the material from the original nodule. The lesion consisted of inflammatory granulation tissue.

W. D. Miller[3] obtained a pathogenic yeast from a dental pulp which he regards as identical with Busse's saccharomyces hominis.

Cohn[4] subjected the yeast isolated by Klein[5] from milk to a thorough study. This is morphologically a pure yeast, which forms distinct capsules in the body of susceptible animals; in the animal body moniliform cylindrical threads develop. It does not ferment sugars, and grows best on a simple acid beer-wort agar. It is pathogenic for mice, in which exceedingly minute quantities suffice to produce nodules in various organs, especially the lungs, consisting largely of yeast cells, also pathogenic for guinea-pigs and rabbits, in which there occurs after a time an elimination and invasion by way of the circulation of various mucous membranes—conjunctivæ, nasal, digestive—which become the seat of an inflammatory process. Localization in the central nervous system with resulting symptoms is a characteristic feature for this organism, especially in rabbits. Similar changes also occurred in a dog. Birds appear immune. In no case did real tumors develop.

ASPERGILLUS FUMIGATUS. Hocheim[6] found aspergillus fumigatus in brownish-yellow, subpleural infarct-like areas in the lungs of a man, aged forty-three years, who died from violent streptococcus and staphylococcus infection following a wound of the finger. The absence of aspergillus in all the acute lesions and in the corresponding vessels in the lungs led Hocheim properly to regard the pneumonomykosis as primarily bronchial, the result of inhalation, and possibly developing in existing embolic hemorrhagic infarcts. The mycotic areas were surrounded by a developing fibrous tissue. The author made animal experiments with the fungus from this case, which proved pathogenic when introduced in various ways, including direct inhalation into the lungs. *Pneumonomykosis aspergillina* was made the subject of a monographic study by Saxer in 1900 (Jena), who then reported four new cases and collected the literature.

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[1] Centralblatt f. Bakt., 1902, xxxi., 759–763.

[2] Journal of Medical Research, 1902, viii., 31–42.

[3] Dental Cosmos, February, 1900.

[4] Centralblatt f. Bakt., 1902, xxxi., 739–748.

[5] Journal of Hygiene, 1901, i., 90.

[6] Virchow's Archiv, 1902, clxix., 163–183.

GENERAL PATHOLOGICAL HISTOLOGY.

Cells in Inflammation and Proliferation. Max von Brunn[1] publishes from Ziegler's laboratory an extensive study upon the rôle of the lining cells of serous membranes in inflammations, as shown by the changes of these cells in experimental lesions of animals and in human peritonitis, pleuritis, and pericarditis. He reaches the conclusions that these cells belong among the epithelial cells for the following reasons: Because, as emphasized by Kolossow, they are provided with a continuous row of fine, peripheral cilia, or intracellular bridges (especially well marked in dogs), and because of their tendency to form connected covering for serous surfaces and to prevent adhesions. Islands of cells lining serous surfaces when included in fibrin may cover the clefts and spaces present so as to give rise to cystic, tubular, and adenomatous formations, because the cells hinder connective tissue adhesions at these points. Le Count[2] has called attention to such tubular formations in peritoneal adhesions about the uterus; v. Brunn found adenomatoid spaces especially after fibrinous pericarditis, the arrangement of fibrin into villous masses giving rise to quiet and protected recesses in which the epithelial cells could multiply. He points out, further, that these cells do not develop connective tissue, and, furthermore, that fibroblasts do not form young lining cells, the latter always arising from preexisting lining cells. The author gives an extensive list of references. In the dog the serous cells show a marked tendency to vacuolation due to absorption of fluid.

Plasma Cells. The established belief that the leucocytes migrating from the vessels during inflammation are incapable of directly contributing to structural repair by progressive changes was seriously weakened by the result of Councilman's studies of acute interstitial nephritis.[3] It will be remembered that he found a pronounced migration of cells with all the features of plasma cells; that they possessed abundant evidence of proliferation, mitotic nuclei, both within and without the vessels. Councilman, like Mallory, Justi, Marschalko, and Paltauf, ascribe their origin to lymphocytes. Krompecher, Hodara, Schöttlander, and others claim that they may be derived from other leucocytes as well.

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[1] Ziegler's Beiträge, 1901, xxx., 417–456.

[2] Journal of the American Medical Association, 1901.

[3] Reviewed in PROGRESSIVE MEDICINE, March, 1899, 252.

The histo-genesis of the plasma cell advanced by Unna, and which has found few advocates, is being gradually replaced by a hæmatogenous origin, and a distinct concession to this tendency is apparent in the work of Pappenheim[1] from Unna's laboratory, wherein the view is advanced that lymphocytes and plasma cells are isochromatic and isomorphological, but, nevertheless, represent separate cell-series in genesis and destiny. Since the foundation of this hypothesis rests upon the ancient belief in the absence of locomotive power of lymphocytes, it is unlikely that it will gain general credence. Councilman's observations of the migration of lymphocytes is supported by the demonstration by Maxinow[2] of amœboid movements in all varieties of leucocytes in rabbit's blood, upon the warm stage at 40° to 41° C.; at 38° to 39° C. only the polymorphonuclear leucocytes showed motion. Maxinow also expresses his belief that emigrated lymphocytes may undergo progressive changes.[3] Not only has the rôle of the plasma cell leucocyte in inflammation been enlarged to include acute processes and migratory ability, but the tinctorial characteristics have been elaborated and phagocytic properties ascribed to it. Beattie[4] believes that the more active plasma cells possess cytoplasm with lessened affinity for basic dyes; also, that they are phagocytic and identical with the large mononuclear leucocytes long known to possess this feature to a remarkable degree. Howard and Perkins,[5] in their work on cells with eosinophilic granulations, attribute an affinity for eosin to the cytoplasm of plasma cells.

Marchand[6] discusses Ranvier's *clasmatocytes*, *mast cells*, and *phagocytes* of the omentum. He regards the clasmatocytes of Ranvier as indifferent perivascular connective tissue cells with pronounced phagocytic and proliferative properties. He also believes that they may produce leucocytic and lymphoid cells, such as mast cells, plasma cells, and the lymphoid cells of round-cell infiltrations. Neumann and Schrieber claim that mast cells and Ranvier's clasmatocytes are identical. It seems that the appearances produced by these cells, when filled with included cells, have led Riddinguis[1] and others to interpret the appearances as signifying endogenous cell production.

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[1] Virchow's Archiv, 1902, clxv., 365; Ibid., 1902, clxvi., 424; Monatshefte f. prak. Derm., 1902, xxxiv., 5.

[2] Fifth supplement to Ziegler's Beiträge, 1902.

[3] Further review of the valuable work of Maxinow will be made later.

[4] Journal of Pathology and Bacteriology, 1902, viii., 129.

[5] Johns Hopkins Hospital Reports, 1902, x., 249–281.

[6] Verh. d. path. Gesellsch., 1902, iv., 124–131.

Johann Almkvist[2] writes on the emigration of *lymphocytes.* Incidental to studies of Pfeiffer's immunity reaction in the case of diphtheria and pseudodiphtheria bacilli injected with fixed quantities of immunized rabbit's serum into the peritoneum of guinea-pigs, he observed the cells that accumulated in the peritoneal fluid. The majority of the cells were polymorphonuclear leucocytes, but transitional forms and small lymphocytes were also present. Lymphocytes appear within twenty to forty minutes—a period so short that Almkvist believes the cells must be the result of active emigration in response to chemotaxis and not of proliferation. Hans Hirschfeld[3] ascribes amœboid movement to lymphocytes, and A. Wolff[4] found so many lymphocytes in a pleural exudate that he ascribes to them the power of active response to chemotaxis. Michaelis and Wolff[5] found granules in the protoplasm of lymphocytes—a fact that Almkvist interprets as indicating a closer relationship between these cells and other leucocytes. Pappenheim,[6] on the other hand, denies all mobility of lymphocytes. But in connection with the review concerning plasma cells,[7] I pointed out that the origin of the plasma cell in lymphocytes implies motility of the latter cell. And Wolff[8] found the lymphocytes in the blood of a lymphatic leukæmic possessed of active amœboid movement.

Askanazy[9] points out that osteoblasts, osteoclasts, and young connective tissue cells as well as young endothelial cells have a basophile protoplasm. He would characterize this basophilia as peculiar to the youthful activity of these cells.

Leo Loeb,[10] by transplanting epithelium into agar or blood serum in the living animal, obtained various changes similar to those seen in carcinoma—*e. g.*, pearl formation. Some of the cells appear to acquire phagocytic properties. Experiments of this kind merit repetition.

Abnormal Karyokinesis. An important contribution to the subject of cell division has been made by Krompecher,[11] who found by studying models of multipolar karyokinesis representing such stereometric

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[1] Verh. d. path. Gesselsch., 1902, iv., 112–118.

[2] Virchow's Archiv, 1902, clxix., 17–28.

[3] Berliner klin. Wochenschrift, 1901, xxxviii., 1019.

[4] Münchener med. Wochenschrift, 1902, No. 6.

[5] Virchow's Archiv, 1902, clxvii., 1.

[6] Ibid., 1901, clxv., 375.

[7] PROGRESSIVE MEDICINE, March, 1899, 247–255.

[8] Berliner klin. Wochenschrift, 1901, 1290.

[9] Centralblatt f. Path., 1902, xiii., 369–378.

[10] Journal of Medical Research, 1902, viii., 109–115.

[11] Centralblatt f. All. Path. u. Anat., 1902, xiii., 273.

figures as tetrahedrons, octahedrons, and hexahedrons, etc., that many of the descriptions and illustrations of irregular mitosis find an easy explanation. The majority by far of these descriptions pertain to sections of tetrahedral karyokinetic nuclei viewed at varying levels and planes. In 313 tumors he found pluripolar mitosis in 47 per cent., and of all the dividing cells examined 60 per cent. were pluripolar. He does not deny the occurrence of asymmetrical division, but maintains that pluripolar division usually follows the type of stereometric bodies. After a careful consideration of the growing tendency to accept certain forms of amitosis as progressive in nature, Krompecher allies himself with the majority of observers in acknowledging direct segmentation and direct fragmentation, described by Arnold as forms of multiplication; indirect fragmentation he believes is retrogressive.

Elastic Elements. Katsurada[1] studied the changes in the elastic fibres of the skin that develop from mechanical injury. While they resist well purely mechanical influences, such as pinching with an artery forceps, they rapidly disappear from subsequent inflammatory changes. He holds that the fragments of elastic fibres that result either from mechanical injury or in course of the inflammatory process never so act like foreign bodies as to cause the formation of giant cells. They may, however, reach the interior of tuberculous giant cells, which he does not believe in any way conserves the elastic fragments. Regeneration of fibres appears to be the result of differentiation in the connective tissue proper.

Sawada[2] discusses the destruction and new formation of elastic fibres in the lungs in various pulmonary diseases without reaching any definite conclusions as to the exact conditions that lead to the destruction of elastic elements which react differently in different forms of inflammation. New formation may take place in chronic connective tissue proliferation in the lungs and in pleural scars without any connection with existing fibres. The exact origin he could not determine, although the new fibres were intimately connected with connective tissue cells. Mechanical and functional conditions seem to have little influence in this formation.

Inouye[3] examined by Weigert's method the elastic fibres in twenty cases of carcinoma of the stomach. The general result is that the elastic fibres are destroyed and crowded out by the tumor, followed more rarely by the new formation of elastic tissue from the pre-existing cells. Meinel[4] reports a *gastric cancer* with marked development of elastic elements. The exact causes for this new growth noted by these and other writers remains unknown.

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[1] Ziegler's Beiträge, xxxi., 296–310.

[2] Virchow's Archiv, 1902, clxix., 263–277.

[3] Ibid., 278–284.

[4] Münchener med. Wochenschrift, 1902, No. 9.

Metaplasia. Pollock,[1] examining calcified lymph glands for bone, found it present in the bronchial glands in 24 of 37 cases, and in the mesenteric glands in 6 of 8 cases. Of 9 instances of calcification of the pleura, bone was present in 5. He has also observed bone in the tonsils, and in 17 per cent. of necropsies in the lungs. Influenced by the work of Pollock, Lubarsch[2] has written a careful consideration of metaplasia and certain allied processes. Under the term *alloplasia* he includes true metaplasia, the transformation of one tissue into another; pseudometaplasia, a change in form rather than structure; and dedifferentiation (to coin a word from "entdifferenzierung"), which covers the anaplasia of Hansemann, or, more preferably, designated kataplasia (Benecke), and other partial reversions to embryonic conditions. This loss of differentiation is ordinarily accompanied by an increased power of proliferation. True metaplasia may be retrogressive or progressive. It is illustrated by the change of one variety of epithelium or connective tissue into other forms of the same group, of flat epithelium into cylindrical or stratified epithelium, or of smooth into striated muscle. Lubarsch believes the coelonic endothelium occupies a middle ground, since connective tissue is formed from it, and it possesses so many characteristics of epithelium. He considers the metaplasia of epithelium to connective tissue as unproven, notwithstanding the work done by Kroymayer and others upon nævi. As an illustration of the converse change of connective tissue into epithelium, he describes a tumor of the tibia with cystic cavities lined with cells resembling short, cubical epithelium, which he calls adenoma osteoblastematosum. It should be remembered that the osteoblasts of Haversian canals often assume cubical shape. The occurrence of striated muscle fibres in the myometrium, Lubarsch would explain as readily by a fœtal metaplasia as by developmental observations. The bearing of metaplastic processes upon the classification and etiology of tumors is important. They account, theoretically at least, for some tumors that are not explained upon the basis of embryonic matrices.

Regeneration. *Nerves.* Charles A. Ballance and Purves Stewart publish a monograph[3] upon healing of nerves in which they, as the result of numerous experiments, reach conclusions contradictory to those most widely accepted at the present time and to the neurone theory as ordinarily stated. The experiments were made upon monkeys, dogs, and cats. Specimens obtained from human patients were also employed.

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[1] Arbeit. aus d. path. anat. Abth., d. körugl. Hyg. Instit. zu Posen, 1901, 154.

[2] Ibid., p. 205.

[3] The Healing of Nerves, London, 1901.

In the peripheral nerve, after division, fragmentation of the myelin sheath begins about the fourth day, and seems to be well established two or three days later, after which time gradual absorption takes place. In the proximal end the cut fibres curve back, are more or less separated by extravasated corpuscles, and thus form a more or less distinct mushroom-like bulb.

After division of a large nerve trunk and immediate suture, new medullary sheaths are first discoverable in the proximal segment close above the place of division, but they are formed entirely apart from the old sheaths of the nerve fibres above, though subsequently the new sheath is guided to the normal fibres by its growth within the neurilemma. In the distal segment new myelin sheaths become visible at the end of the fourth week, at which time they are relatively scanty in the intervening scar tissue. At this time the new sheaths appear beaded, due to the presence of cells from which the myelin is produced. Eventually the neuroblasts become less conspicuous, and are finally found only at each internodal point In the scar tissue it is claimed that the new sheaths increase in number from above downward.

In nerves divided but not sutured a permanent end-bulb develops on the proximal segment due to formation of new sheaths with recurved neurilemmata—these new sheaths do not seem to pass beyond the beaded stage.

In the distal segment new sheaths appear as fine dark lines along one side of fusiform cells, the subsequent growth being slow, never passing beyond the beaded stage.

In transplantation experiments numerous young myelin sheaths appear at the end of the fifth week, chiefly in the neighborhood of ingrowing bloodvessels, along which invading neuroblasts enter the graft, which acts merely as a scaffolding.

Regeneration of the axis-cylinders, studied by means of Golgi's method, begins first in the lower end of the proximal segment, with an increase in the number of spider cells normally present. Soon similar cells appear in the intervening scar tissue and in the distal segment. The processes of these cells run longitudinally in the segments, but form a network in the intervening scar tissue. From the appearances "it is clear that regeneration of the axis-cylinders does not take place by a process of outgrowth from the proximal segment, but is commenced and completed by the activity of cells already existing in the trunk of the nerve."

With Stroebe's method for differentiating axis-cylinders (which stain deep blue on a pink background), regeneration also appears first in the proximal segment as small blue threads independent of the central axones. Similar changes appear much later and less well marked in lower segments as very fine blue lines alongside the proliferated nuclei of the neurilemma; the ends fuse together, and there is formed long, blue, beaded lines. Junction between the proximal and distal segments of a divided nerve is not essential for regeneration of axis-cylinders in the latter, but such axis-cylinders do not attain maturity.

The cellular changes were studied by Von Gieson's method. It is noteworthy that leucocytes wander into distal segment throughout its whole extent, while in case of the proximal segment this occurs only in the vicinity of the wound. After a few days the leucocytes are gradually replaced by migratory connective tissue cells, which also invade the lower segment more numerously and extensively than the upper. These cells at once attack the myelin by phagocytosis. Proliferating neurilemma cells have rod-shaped nuclei, the long axis parallel with that of the nerve fibre forming closely-set longitudinal columns and chains. At first patchy, the neurilemma cell proliferation soon becomes general, taking place generally throughout the whole length of distal segment, whether the divided nerve has been sutured or not. These cells also act as phagocytes. Eventually they abandon this activity, arrange themselves in columns opposed to the newly-formed myelin, several sets of new neurilemma sheaths replacing the old. The cells in the grafts of nerve tissue play no active part in regeneration, being entirely absorbed.

This, in brief, is the process of nerve-healing according to Ballance and Stewart. Contrary to the most commonly accepted teaching, that regeneration of nerves is accomplished by outgrowths from the proximal end, they hold to the "peripheral theory that axones, medullary sheaths, and neurilemmata are formed from pre-existing cells—neuroblasts—in the distal part of the nerve." Short lengths of axones and sheaths are formed that link themselves together, and thus restore the continuity of the nerve. The resting neuroblasts form the neurilemma sheaths, and it is the absence of these sheaths in the central nervous system that explains the very limited degree of regeneration there. Ballance and Stewart also cite cases of early return of sensation after the secondary suture of divided nerves—the cases of Ogston, Jessop, Langenbeck, MacCormac, and others, as well as a personal observation—as proof of the correctness of the theory of peripheral regeneration, the secondary suture merely restoring the conductivity of the fully regenerated parts. This early return of sensation in secondarily sutured nerves is certainly a puzzling phenomenon. I do not think that it has been established by actual examination that it is dependent upon the conditions suggested by the English investigators. In fact, the phenomenon is variously explained by writers, and there are many conflicting statements about it in the literature. It is singular, too, that so far as I know there is no early return of motion under these conditions. For these reasons the immediate or early return of sensation in secondarily sutured nerves cannot be regarded as final proof of the correctness of the "peripheral theory" of nerve regeneration. If the cells in the neurilemma have the power to form pieces of axones and medullary sheaths, it becomes rather difficult to understand why the degeneration following division of a nerve is confined to the peripheral end and not present except to a very limited extent in the central part. There would be, according to the "peripheral" theory, just as much vitality in the peripheral portion as in the central or proximal portion. On the other hand, degeneration distal to the point of division is easily understood when we regard the neurones as functional, nutritive, and anatomic units, as single cells. And in no other way are we able at present to explain readily the nerve degeneration that follows necrosis or necrobiosis of the neurocytes in the nervous centres. On the whole, it seems to me that, suggestive as Ballance and Stewart's microscopic findings are of peripheral discontinuous regeneration, their work does not justify a radical modification of our present conception of the neurone.

F. W. Mott[1] finds less phosphorus in degenerating than in normal nerve tissue, due, he thinks, to the splitting up of complex phosphoretted fats with escape of phosphorus compounds into the blood. He believes that the cells in the neurilemmal sheaths play some part in the regeneration of nerves, and the sensory nerves "may become myelinated and regenerated independently of connection with the central cell of origin," the incoming stimuli from the peripheral sensory nerve-endings, which persist after section of the nerves, vivifying the "protoplasmic basis" laid down by the cells of the neurilemma. In the case of the motor nerves, however, regeneration does not occur independently of the central cells of origin.

Kidneys. Galleotii and Villa-Lanta[2] studied the changes in compensatory hypertrophy of the kidneys. In animals not fully developed unilateral nephrectomy leads to an increase in the number of glomeruli and convoluted tubules, the size of which remains practically unchanged. In full-grown animals nephrectomy does not lead to an increase in the number, but in the size of the glomeruli; and the cells of the convoluted tubules also become larger. In both cases the hypertrophied kidney acquires a vascular filtration surface nearly equal twice the extent of the filtration surface of the normal kidney. In the young animals this is accomplished by hyperplasia of the glomeruli; in the older by hypertrophy. Similar changes occur in the convoluted tubules. It seems that at different periods of life the living substance of cells reacts differently toward the same stimuli.

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[1] British Medical Journal, September 27, 1902.

[2] Ziegler's Beiträge, 1902, xxxi., 121–142.

Retrogressive Processes. FATTY AND OTHER CHANGES. Cowan[1] presents a morphological study of *fatty degeneration of the myocardium*, which he finds is of common occurrence in minor degrees recognizable microscopically only. The distribution may be patchy or diffuse. From microscopic evidence the condition is regarded as a true degeneration of the muscle cell, which also presents other changes and which probably is impaired in its contractile power. He attributes the causes to relatively insufficient blood-supply, the toxic conditions, and to combinations of these two. In the early stages the fibril bundles are the parts involved, and the fat appears in longitudinal arrangement.

Kischensky[2] studied *resorption of fat in the intestine* and its further transport by means of scarlet R., a stain which demonstrates fat much better than osmic acid. The presence in the cuticular lines of the intestinal villi of fine fat granules differing in size and shape from those present in the intestinal contents leads Kischensky to the belief that part at least of the fat is taken up in granular form, while some is absorbed in the dissolved form. In young cats the fat was followed into the chyle vessels and the adenoid tissue. In the sinuses of the mesenteric glands fat particles are arrested especially in the endothelial cells, many of the latter being free, and probably they carry the fat further into the thoracic duct. In these animals there results an extensive and widely distributed fatty infiltration. Granular eosinophile cells are numerous in the intestine and elsewhere in young cats; these cells do not contain fat, and diminish in starvation.

From the study of the *fat contents in renal infarcts*, Fischler[3] reaches the conclusion that in all forms of fatty change extracellular factors are essential, because in renal infarcts (rabbits) fat appears only in those parts in which there is some circulation, though quite complete. Furthermore, the cells must be "alive." Fischler's results do not support the idea that fat may be formed from albumin within the cells.

The work of Rosenfeld and others showing that in fatty changes of the type ordinarily designated as *fatty degeneration*, the fat contained in the degenerated cells was a true infiltration from outside the cells, has received confirmation by Leick and Winckler.[4] They found that dogs fed upon lean horseflesh and mutton tallow had deposited in the fat depots of the body a fat very similar in composition to the fat of sheep.

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[1] Journal of Pathology and Bacteriology, 1902, viii., 177-199.

[2] Ziegler's Beiträge, 1902, xxxii., 197-252.

[3] Centralblatt f. Path., 1902, xiii., 418-422; see also Virchow's Archiv., 1902, clxx, 100-151.

[4] Archiv f. Exp. Path. u. Pharm., 1902, xlviii.

If in such dogs a "fatty degeneration" of the myocardium was produced by phosphorous poisoning, the fat in the myocardium was found to be of the same composition as that in the rest of the body—that is, like mutton fat. If the fat were produced by a transformation of the muscle cytoplasm into fat it certainly would not be of a foreign type, like sheep's fat, and the only possible conclusion is that the fat was obtained by transference from the fat depots.

There are found in the cortical cells of the adrenal, in the thymus during retrogression, in certain amyloid kidneys, in products of bronchial secretion, and in the corpus luteum, according to Kaiserling and Orgler,[1] doubly refractory intracellular globules, which are ordinarily taken for fat, although they do not give the characteristic reactions. The authors are unable to determine their exact chemical nature, suggesting lecithin or protagon, but give it the tentative name of "myelin." Except in the adrenal the cells containing myelin granules are in a necrobiotic condition, and it is thought that many fatty degenerations, so-called, are really accumulations of this substance. The myelin granules are of a size to be mistaken for "fatty degeneration" rather than for fatty "infiltration."

Katsurada[2] has studied the *occurrence and distribution of glycogen* under pathological conditions. From experimental studies he concludes that leucocytes under normal conditions do not contain glycogen in demonstrable quantities, the glycogen only appearing in emigrated leucocytes or when degenerations occur in the vessels. Embryonal cells and giant-cells often contain glycogen in large quantities, and especially when placed for a time under unfavorable nutritive conditions; hence the appearance of glycogen may be regarded as evidence of degeneration. The observations that led to the foregoing conclusions were made upon animals, such as dogs, rabbits, and chickens, into which there were inserted plates of pith that were removed at varying intervals and studied by Barfurth's method for demonstrating glycogen in the emigrated cells. (Fixation in absolute alcohol or Fleming's solution, celloidin; Barfurth's glycerin-iodine mixture—iodine, 1; potassic iodide, 1.5; water, 100—added when used to an equal part of glycerin; dehydrated by means of tincture of iodine; oil of origanum.)

The occurrence of *glycogen in exudates* has been studied quantitatively by Loeper,[3] and found to vary in direct proportion to the number of cells still retaining staining properties. In exudates in which the cells have lost their staining powers—*e. g.*, in a tuberculous pyothorax—there is practically no glycogen, while in acute exudates full of cells, such as pneumococcus pleurisy, the amount of glycogen is relatively large (0.62 gramme per litre). The glycogen is in the leucocytes, both monomorphonuclear and polymorphonuclear, and remains as long as they retain their vitality. Wherever exudates have cells, there glycogen will be found. In sterile salpingitis pus is not found, while in the first days of gonorrhœa it is abundant. The presence and amount of glycogen is of no value in determining the nature of an exudate.

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[1] Virchow's Archiv, 1902, clxvii, 296.

[2] Ziegler's Beiträge, 1902, xxxiv., 173–192.

[3] Archiv de med. Exp., 1902, xiv., 576.

In *cirrhosis of the liver* Brault[1] has found that a large number of hepatic cells preserve the power of elaborating glycogen, even the cells isolated in islands by connective tissue. Sometimes the irritation suffered by the liver cells seems to have caused an increased glycogenic function similar to that in the tissues surrounding tumors. At times the liver contains no glycogen in health, and particularly interesting are instances in which the liver of patients suffering with malignant tumors is devoid of glycogen, while the tumor cells contain it abundantly. Glycogen is always intracellular, but never within the nucleus, and it may be found in cells containing large droplets of fat.

That a certain amount of *amyloid degeneration* is a very frequent process is the opinion of L. Timoferev,[2] for he finds that it is present in the tissues of the floors of all ulcers, whether chronic or following acute abscesses; in dogs and rabbits it may be produced by experimental suppuration as early as three days. Its general dissemination, sufficient to be recognized at the autopsy table, occurred but 105 times in 6320 necropsies studied by F. W. Zahn,[3] amounting to 1.66 per cent., and of these 105 cases in all but 7 there was tuberculosis. There were also two instances of localized tumor-like formations of amyloid material—once of the tongue and once of the air passages—that were not included.

Monery,[4] by chemical analysis of an *amyloid liver*, found that the amyloid material consisted of chondroitin-sulphuric acid and an albumin belonging to the nucleo-proteids. In almost all forms of amyloidosis there is great destruction of cells in the body, thus increasing the amount of nucleins in the economy, which he believes combine with chondroitin-sulphuric acid in the various tissues and organs where it is most abundant.

Brourcy[5] concludes a series of investigations on the *origin of amyloid material* by saying that amyloidosis is an infiltration of the tissue with extravasated erythrocytes which have been altered into amyloid material by chemical union with substances mostly of necrotic origin. This conception, he says, explains the localization and the morphology of amyloid deposits and the close relation between amyloid material and the bloodvessels. In this view Broucy agrees with Obrzut and Browicz.

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[1] Archiv. de med. exp., 1902, xiv., 453.

[2] Gaz. klin. de Botkine, 1902, xiii., 296.

[3] Münchener med. Wochenschrift, 1902, xlix., 49.

[4] Journal de Path. et de Phys. gén., 1902, iv., 877–884.

[5] Abstract from articles in the Polish language in Centralblatt f. Path., 1902, xiii., 84–87.

Konstantinowitsch[1] concludes a study of *hyaline bodies in rhinoscleroma* as follows: In rhinoscleroma the hyaline bodies form in endothelial cells from the remnants of red blood corpuscles taken up by the cells. The idea that hyaline bodies in rhinoscleroma tissue are derived from the bacilli present cannot be substantiated.

Walz[2] reports some cases which show that coal dust probably not rarely occurs within the bloodvessels—*coal embolism* of cerebral vessels—coal in circulating blood. The most likely source of entry is held to be the peribronchial glands. In another case of passive congestion of the lungs there were coal-containing heart-failure cells within the bloodvessels.

Pathological Calcifications. Jerusalem[3] found branching osteomatous formations in the lungs, which he suggests may have arisen from embolism of cells from the bone-marrow.

Mönckeberg[4] describes six instances of true ossification in the aorta and other large vessels which in each case were the seat of a *senile arterio-sclerosis.* He regards this as a late stage in arterio-sclerosis, and believing that true ossification in the aorta and peripheral vessels is more common than ordinarily thought—in his material about 10 per cent. showed bone formation—he points out the necessity of further studies in order that the process may be understood better.

Joannovics[5] describes calcification and genuine ossification in an "atheroma" of the back of the neck. Only three previous instances are known.

In three cases of advanced *sclerosis of the cerebral arteries* Marburg[6] found well-marked hyaline cartilage, which had formed by metaplasia. H. Müller has described a similar change in the arteria retinæ centralis, and Monckeberg[7] shows that cartilage may precede ossification of the vessels. Sacerdotti[8] and Fraltin[9] found that in rabbits ligation of the renal vessels is followed by the formation of true bone with characteristic marrow cells at the apices of the medullary pyramids.

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[1] Virchow's Archiv, 1902, clxvii., 443–464.

[2] Baumg. Inst., 1902, iii., 540–549.

[3] Jahrbuch der Welnes k. k. Krankeranstalben, 1900, vii. (Abstract in Centralblatt f. Path., 1902, xiii., 13.)

[4] Virchow's Archiv, 1902, clxvii., 191-210.

[5] Centralblatt f. Path., 1901, xii., 883–887.

[6] Ibid., 1902, xiii.

[7] Virchow's Archiv, 1902.

[8] Abstract from Italian, Centralblatt f. Path., 1902, xiii., 334.

[9] Virchow's Archiv, 1902, clxviii., 431–443.

Burns. McRae[1] finds that the internal lesions of superficial burns are characterized by diffuse degeneration and focal changes of lymphatic tissue, the latter consisting especially of proliferation of the endothelial, cells with phagocytosis of leucocytes and other cells, resulting in fragmented and disintegrated areas. Whether the cells destroyed by the phagocytic activity of the endothelial cells are previously damaged or not seems to be an open question, but all seem agreed that the lesions are of toxic character.

Colloidal Solutions. Gallotti and C. Todde[2] studied the histological changes produced by colloidal solutions of metals as compared with those of metallic salts in electric dissociation. They used such solutions of platinum, gold, silver, molybdenum, copper, and cobalt. There resulted a marked wasting and atrophy due to a catalytic action of the metals upon the chemical processes in the tissues.

Whitening of Hair[3] (Canities). Metchnikoff[4] ascribes whitening of the hair to an increased and abnormal activity of epidermal cells from the medullary layer of the hair. These cells remove the pigment by phagocytosis, hence they are termed pigmentophages. The factors of the mechanism at work are not at all understood.

Changes in the Nervous System in Rabies. Referring to the statements made in PROGRESSIVE MEDICINE, March, 1902, pp. 340 and 341, concerning the diagnostic value of the ganglionic, bulbar, and spinal lesions in rabies, the following abstracts are added by way of continuation of the subject.

Paviot and Lesieur[5] describe fully three cases of human rabies with special reference to the lesions in the central nervous system and the ganglia, confirming fully the existence of the lesions described by Babes in the bulb and by von Gehuchten and Nelis in the ganglia. Paviot and Lesieur note the wide distribution of these lesions throughout all parts of the nervous system, and they emphasize especially the occurrence in two of their cases of capillary emboli or accumulations of polymorphonuclear leucocytes in the spinal and sympathetic ganglia, in the cerebrum, cerebellum, and cord. They regard these leucocytic accumulations as of just as much significance as the lesions of Babes and von Gehuchten and Nelis.

Babes[6] regards the premonitory leucocytosis of rabies as the result of toxin production, and shows that in the brain the leucocytes may occlude the vessels and accumulate in nodules.

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[1] Transactions of Association of American Physicians, 1901, xvi., 153-165.

[2] Lo Sperimentale, 1902, lvi., 341-362.

[3] See PROGRESSIVE MEDICINE, September, 1902, p. 153.

[4] Annales de l'Institut Pasteur, 1901, xv., 865-879.

[5] Journal de Phys. et Path. gén., 1902, iv., 677-692.

[6] Leyden's Festschrift, 1902, Bd. i., 39.

Anglade and Chocreaux[1] claim that proliferation of neuroglia plays a prominent part in the building-up of the rabic nodule. Not only the perivascular but also the ependymal neuroglia proliferate. Biff[2] and Daddi[3] corroborate the general finding of characteristic lesions in the nervous system of rabies. Centanni[4] finds that a precipitate forms on mixing emulsions of the nervous tissue of a rabic rabbit with a corresponding antirabies serum. Later agglutination and lysis supervene. Further studies are necessary.

Parathyroid Glands and Chemistry of Goitres. Benjamins[5] discusses the pathological anatomy of the parathyroid glands, which in man probably develop from the fourth branchial cleft, and which generally occur in pairs, one on each side. He regards the duct-like passage observed by Kohn and others in connection with the parathyroid glands as analogous to the thyroglossal duct, and proposes for it the name ductus parathyroideus. In addition to the usual regressive and other changes, Benjamins found miliary tubercles in the parathyroids in a case of tuberculous infection. In goitre the parathyroids do not seem to undergo any specific changes. As long as there is no definite knowledge as to the function of these glands in man, surgeons would probably do wisely by leaving them *in situ* whenever possible in thyroidectomies. They are found mostly on the posterior free margin of the lateral lobes of the thyroid near the branches of the arteria thyroidea inferior.

Benjamins describes a parathyroid tumor of slow growth in a man, aged fifty-seven years. Of the size of a child's head, irregularly nodular, surrounded by a fibrous capsule, it was of a papillary structure, the epithelial cells greatly resembling those of the parathyroid. Small clumps of colloid occurred between the cells here and there. The author is inclined to regard this tumor as coming from the parathyroid.

A. Oswald[6] has made a study of the chemistry of a large number of goitres, both exophthalmic and simple. As a rule, the amount of iodine is found to correspond to the amount of colloid, there being much in colloid goitres and little in the hyperplastic type. However, as the amount of colloid increases there appears in progressively increasing quantities a thyroglobulin that differs from the normal solely in not containing iodine. It would seem from his observations that iodine combines with thyroglobulin only just about as it is ready to be excreted into the alveoli, and since in goitres obtained from individuals who are receiving iodides therapeutically there is a great amount of iodine combined as iodine thyroglobulin, the goitre cannot be due to a failure of power of forming normal iodothyrein. He is inclined to think that the first stage in the formation of goitre is a lack of iodine in the food, leading to accumulation of thyroglobulin devoid of iodine in the vesicles, since this abnormal product is not excreted, and the further changes of goitre are secondary to the resulting disturbance of normal processes. The colloid of goitre seems to have no difference in physiological effect from normal colloid of corresponding iodine content, but the nature of colloid from exophthalmic goitre has not yet been studied further than the observation that there is no essential difference in the iodine content of simple and exophthalmic goitre.

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[1] Centralblatt f. de Soc. de Biol., 1902, liv., 575–577.

[2] Abstract from Italian in Centralblatt f. Path., 1902, xiii., 339.

[3] Ibid., 348.

[4] Ibid., 340.

[5] Ziegler's Beiträge, 1902, xxxi., 143-182. (Good bibliography.)

[6] Virchow's Archiv, 1902, clxix., 444.

TUMORS.

The Parasitic Theory of Cancer. The cause of cancer remains unknown. The advocates of the parasitic theory have not brought forward any proof to strengthen their position, which, on the other hand, has been attacked successfully at various points. The parasitic theory receives a thorough and critical consideration at the hands of Noesske.[1] In my mind his is one of the best and most concise criticisms of the parasitic theory so far presented. Retracing Plimmer's work, he was disappointed in not being able to confirm the finding of the so-called Plimmer's bodies, except in carcinomata of the rectum, mammary gland, and glandular carcinomata elsewhere. He, however, found Plimmer's bodies in other lesions, such as indurative pneumonia. Plimmer's bodies are regarded as particles of changed cellular secretion, with central condensation, located within vacuoles. Consequently the form and size may vary according to the concentration and quantity of material. Noesske points out further that it is an erroneous procedure to compare human, malignant tumors with growths upon vegetables and trees, because the plants react in the same way toward all sorts of abnormal stimuli, and that is by proliferation. In several recent articles on the parasitic nature of the cellular inclusions in carcinoma, much stress has been laid upon the growths produced in cabbage by plasmidiophora brassicæ, which resembles more or less the carcinoma bodies. The sum and substance of Noesske's reflections are that neither experiment nor microscopic findings nor clinical observations has demonstrated the parasitic nature of carcinoma. It no doubt has occurred to others as it has to Lubarsch, that the parasitic theory only with great strain is applicable to such tumors as embryonal adenosarcoma of the kidney, hypernephroma, congenital tumors, etc.

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[1] Verh. deut. Gesellsch. f. Chir., 1902, xxxi., 304–314.

Foulerton[1] summarizes his views in regard to the parasitic theory as follows: "1. That a hypothetical parasite does not in any important way elucidate the pathology of carcinoma. 2. That, so far as theoretical considerations go, the balance of probabilities is against the theory that carcinoma is caused by a parasite from without. 3. That there is no evidence that any of the parasites which have been described as the cause of carcinoma have any cause or relationship to the disease. 4. That while we are ignorant as to the immediate causation of cancer, the practically undisputed fact that the epithelial cells, whose vicious proliferation produces the obvious phenomena of carcinoma, are capable of migration from their normal environment, and of self-reproduction when in abnormal surroundings, renders any parasitic theory unnecessary."

Le Count[2] points out the rather striking analogies that exist between Plimmer's bodies and certain structures normally demonstrable in the cytoplasm—centrosome, achromatic substance, or archoplasm—but heretofore practically left out of consideration by the cancer parasitic advocates. He concludes, and with reason, that the analogies are prominent enough to require those that urge the parasitic nature of Plimmer's bodies in cancer to first exclude or account for the centrosome and other archoplasmic formations in cancer cells. White[3] also emphasizes this point. Benda,[4] in a discussion on the etiology of carcinoma at the meeting of the German Surgical Society, states that he has found the archoplasmic structures intact by the side of cell inclusions or so-called cancer parasites of certain authors. Borrel, it will be recalled, concluded that the intracellular cancer parasites were the result of degenerative and other changes in the archoplasmic structures.

Greenough[5] finds "cancer parasites" in non-cancerous diseases of the mammary gland. He regards them as the result of secretory processes.

Israel[6] believes that the structures described in cancers by Sjöbring as rhizopoda are simply fat globules. The amœboid movement described by Sjöbring is explained as the result of the action upon fat of alkaline fluid—*e. g.*, soda solution. Israel is not attracted at all by the parasitic theories of cancer, and favors the view that increased tendency to proliferation is the result of adaptation and inheritance. Surface epithelium, for instance, is exposed continuously to small losses which give rise to proliferation. In the case of glands functional influences frequently induce proliferations. Hence, practically all the injuries—mechanic, chemic, thermic, parasitic—that affect surface cells may be the cause of cancer if the corresponding epithelial cells are excessively prolific.

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[1] Practitioner, 1902.
[2] Journal of Medical Research, 1902, vii., 383-394.
[3] Lancet, February 15, 1902.
[4] Verh. deut. Gesellsch. f. Chir., 1902, xxxi., 73.
[5] Journal of Medical Research, 1902.
[6] Archiv f. klin. Chir., 1902, lxvii., 446-472.

Marchand[1] would trace epithelial tumors to the action of toxic substances produced by the cells themselves on account of derangement of their activities.

Sternberg,[2] in an experimental study of pathogenic blastomycetes, including Busse's and Sanfelice's organisms, shows that the changes produced in the tissues are of an inflammatory or granulomatous character. He found no support for the view that yeasts may cause malignant tumors.

Edward H. Nichols[3] failed to obtain aught but areas of granulation tissue by the inoculation of Sanfelice's and Plimmer's organisms. Similar conclusions are reached by Henry W. P. Young in the Cancer Research Laboratory at the Middlesex Hospital in London, which has issued the first number of its reports. The main bulk of the new-growths is often made of the parasites themselves. In the same report Foulerton and Price-Jones state that their bacteriological study of cancers entitle them to conclude that the parasites of cancers, if parasites they contain, are not visibly cultivable on ordinary media under usual conditions.

Tyzzer[4] shows that coccidiosis of the rabbit's liver is essentially inflammatory—a view also taken by Lubarsch in his discussion of v. Leyden's paper on "Parasites in Cancer,"[5] and not at all analogous in course and termination to those of carcinoma, thus depriving the parasitic advocates of the support they have drawn from the supposed tumor-like proliferation of epithelial cells under the influence of coccidium oviforme. And Charles J. White and William H. Robey, Jr.,[6] do the same for molluscum contagiosum, the peculiar bodies of which, regarded by some as protozoa, they show to be composed of keratin.

Sanfelice[7] discusses at length the interpretation of atypical cellular forms in carcinoma. He criticises the interpretations of Borrel, Nichols, and others because they have, he claims, mistaken cellular degeneration for parasites, or rather for what they assume others claim to be parasites.

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[1] Deutsche med. Wochenschrift, 1902, xxviii., 693–696.

[2] Verh. deutsch. path. Gesellschaft, 1902, iv. 161–165.

[3] Journal of Medical Research, 1902, vii.

[4] Ibid.

[5] Deutsche med. Wochenschrift, May 2, 1902.

[6] Ibid.

[7] Centralblatt f. Bakt., 1902, xxxi., 254–267.

F. J. Bosc[1] claims that the inoculation of monocystis—a sporozoic organism—in rabbits and other animals give rise to remarkable cellular proliferations and to inclusions identical with those seen in cancer and "clavelée."

Feinberg[2] describes organisms within cancer tissue that he regards as animal in nature existing in an encysted form. Oscar Hertwig, to whom Feinberg submitted his preparations, is inclined to regard these supposed organisms as artificial vacuoles.

Further Studies in Transplantation of Tumors. Leo Loeb[3] reports upon further investigations in the transplantation of tumors (see PROGRESSIVE MEDICINE, March, 1902, pp. 351, 352). Again, there is described a series of successful transplantations of sarcoma of the thyroid in white rats, the original tumor being a mixed and adenocarcinoma of the thyroid. Experiments with white mice, guinea-pigs, and rabbits were without result. The injection of fluid produced by cystic softening in the tumors or obtained by mincing pieces of tumor tissue in salt solution did not produce any new tumors, and, as would be expected, injections of filtrates were also without result, indicating, it would seem, that the cause is intimately associated with the tumor cells. Jensen, from similar experiments on mice, concluded that the cells themselves were the infecting agents. In Loeb's series local metastases and metastases by implantation on continuous surfaces occurred. The growth of the tumors caused by transplantation was more rapid than the growth of the primary tumor, both in the former series and in the present. Pieces kept on ice from one to five days produced tumors on inoculation. Exposures to the X-rays repeated several times for ten minutes did not destroy the cause of the growths. Transplantation experiments with an adenocarcinoma of the breast in a rat did not produce any definite tumors in other animals of the same species. In the same animal some growth took place in transplanted pieces.

Herzog[4] also reports upon tumor transplantation and inoculation in white rats. He criticises Mayet's[5] claim to have produced tumors in animals by the injection of filtrates and extracts from human tumors because the lesions produced were not true neoplasms. Herzog's starting point was a cystic sarcoma of the thyroid identical in structure with the tumor used by Loeb in his first series. The rat was probably a descendant of the one used by Loeb. The transplantation experiments were frequently successful, especially in pregnant female rats, the failures being comparatively few. In all eight tumor generations are recorded. Herzog believes from the results of experiments with X-rays in the treatment of these tumors that they have little or no effect on rapidly-growing sarcoma. His experiments with cell-free tumor material obtained by filtration of emulsions through Pasteur filters all gave negative results. Certain experiments with collodion sacs also failed. He suggests that, while tumors may be caused by ultramicroscopic organisms, these may be so intimately associated with the cells as not to be able to exist outside of living cells.

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[1] Compt.-rend. de Soc. de Biol., 1902, liv., 578–579.

[2] Deutsche med. Wochenschrift., 1902, xxviii., 185–189.

[3] Journal of Medical Research, 1902, viii., 44–73.

[4] Ibid., 74–82.

[5] Gazette des Hôpitaux, 1902.

It seems to me that the principal conclusion to be drawn from Loeb's and Herzog's interesting results is that in the white rat has been found an animal in which transplantation of at least one form of tumor, namely, sarcoma, is so uniformly successful that it may be possible by careful variation of the experiments to obtain some insight into the cause of the sarcoma, even though it may remain unseen or unrecognized. The influence of various factors, as preservation outside of the body, heat, cold, etc., may be studied still further. Efforts at treatment and at immunization at once suggests themselves. The production of a sarcocytolytic serum could be attempted according to the same principles that underlie the development of cytolytic serums in general (see reference to the work of Jensen and of Leyden and Blumenthal). Noesske regards successful transplantations of malignant tumors in animals of the same species as analogous to metastasis.

Von Leyden and Naunyn[1] each mention an instance of the development of gastric carcinoma in persons who by accident swallowed contents of the stomachs of carcinomatous patients.

Processes of Healing in and the Action of X-rays on Carcinoma. Petersen became impressed with the frequency of giant cells in carcinoma of the skin. He examined 120 cases of carcinomata carefully in regard to this point, with the result that giant cells, often in large numbers, were found in 29. Excluding by critical tests the combination of tuberculosis and carcinoma, of which Moak[2] reports five fully established cases.[3] Petersen points out that the histological appearances in these cases speaks in favor of the giant cells being engaged as phagocytes in removing degenerate epithelial cells and horny material. Giant cells may mean, therefore, that healing processes are going on in the carcinoma. This thought at once leads one into the fascinating field of cytolysins and the possibility of producing anticarcinoma or

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[1] XX. Congress f. inner Med., Centralblatt f. Path., 1902, xiii., 317.

[2] Journal of Medical Research, 1902, viii., 128–148.

[3] Kallenberger (in Arbeiten aus Baumgarten's Institut, 1902, iv., 58–68) describes a case of tuberculosis and carcinoma of the mamma, the tuberculous nature of the lesion being definitely established, as in Moak's cases, by the demonstration of the bacillus.

"carcinocytolytic" serum. Petersen cites good examples of the probable removal by phagocytes of early metastatic foci. The peculiarities connected with the distribution of the metastases of carcinoma are still unexplained in a large measure, and it is not at all unreasonable to attribute this to the operation of natural influences that are unfavorable to the development of carcinoma cells. Further studies along these lines are fully indicated.

Of interest in connection with this phase is also the increasing number of actual and complete cures, especially in the case of carcinoma affected by means of repeated exposure to X-rays in the hands of W. A. Pusey[1] and others. So far as the reports go, this effect seems to be due in a large measure to a direct action of the rays upon the carcinoma cells, which undergo degeneration and eventually are replaced by connective tissue. From the histological examinations so far at hand of carcinomata undergoing removal under the influence of X-rays it does not seem that phagocytic giant-cells play any part in the process.

Recurrence in Carcinoma. R. Volkmann established the law that if local and regional recurrence and distant metastasis failed to take place at the end of three years after the operative removal of carcinoma, the cure could be regarded as permanent. Labhardt[2] shows that Volkmann's law cannot be accepted as final, by collecting 112 cases of recurrence after the third year. Late recurrences may develop as long as twenty years after the operation. In most cases the recurrence was in the scar. It is possible, of course, that in some cases of this kind it concerns not recurrence but development of carcinoma *de novo*, and v. Kahlden[3] brings forward the idea that there not only may be, as Peterson shows, a pleuricentral, but also a pleuritemporal growth of carcinoma.

Anticancer Serums and Serum Reactions in Cancer. Wlaeff[4] reports a remarkable case of cylindrical-celled carcinoma of the uterus, ovaries, and peritoneum apparently fully cured by repeated injections of antiblastomycetic serum. The peritoneal fluid before the beginning of the injections did not agglutinate or dissolve blastomycetes, but after the disappearance of the tumors the ascitic fluid, now attributed to cirrhosis of the liver, agglutinated and dissolved the blastomycetic organisms. Wlaeff states that the serum of patients who have received thirty to forty injections of the serum which he has prepared dissolve and agglutinate blastomycetes.

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[1] Journal of the American Medical Association, April 12, 1902. See also Beck, New York Medical Journal, 1902, lxxv., 881–885.

[2] Beiträge z. klin. Chirurgie, 1902, xxxiii., 571–626.

[3] Verh. d. deut. Gesellsch. f. Chir., 1902, xxxi., 579–584.

[4] Compt.-rend. de Soc. de Biol., 1902, liv., 412–414.

Brouha[1] has studied the blood of the cancerous with reference to the presence of antibodies for blastomycetes. He found that normal serum and serum of the cancerous do not contain agglutinins for the blastomycetes used. He then tested the serum of the cancerous for the presence of immune body by means of the absorption method of Bordet and Gengou: 1. Four drops of an emulsion of blastomycetes, 12 drops of cancer serum heated to 56° C. for thirty minutes, and 2 drops of fresh normal serum were added and the mixture placed at one side for four hours. 2. In the meantime blood corpuscles of a fowl washed in salt solution are added to the heated serum of a rabbit previously immunized by repeated injections of fowls' blood (6 drops of emulsion of corpuscles and 10 drops of heated hæmolytic serum). Now a drop of this mixture was allowed to fall into the first mixture. If the blastomycetes absorbed and fixed the complement of the fresh blood, the corpuscles would remain intact. The results are interpreted to show that neither normal serum nor the serum of the cancerous contains an immune body for blastomycetes tested. In view of these results the etiological rôle of blastomycetes may be considered doubtful, but it is important to bear in mind that these "absorption experiments" are made on the theory that there is but one complement. This theory is not in accord with many demonstrations by Ehrlich and his pupils (see under Cytolysis, etc.).

Tusini[2] finds that the juices of malignant tumors do not have a definite action when injected into the bodies of animals. The juices are not suitable for the culture of pathogenic microbes or blastomycetes and do not afford any immunity against these. In rabbits prolonged injection produces cytolytic powers in the serum.

J. B. Charcot[3] attempts to obtain an anticancerous serum by injecting animals with emulsion of human cancers in physiological salt solution. In order to prevent the development in the serum of the animals injected of hæmolysins for human corpuscles, the cancerous tissue is washed repeatedly in salt solution. The results as yet obtained are merely tentative. Twenty to thirty cubic centimetres of the serum are injected every few days. So far it has been borne well, especially that of the goat. Charcot has found that, after a few injections, the serum of the patient becomes hæmolytic for the corpuscles of the animal furnishing the serum.

Jensen,[4] of Copenhagen, and Leyden and Blumenthal[5] report encouraging results with carcinoma serum. Jensen worked with transplantable carcinomata in mice, and produced by repeated inoculations of rabbits with cancer particles a serum that, according to the reports, caused marked degenerative changes in a tumor affecting a mouse. Leyden and Blumenthal worked with carcinomatous dogs. By repeated injection of rabbits with pulpified carcinoma tissue they endeavored to obtain a specific serum, injections of which were followed by softening in the tumor. They found, also, that the injection of fluid expressed from freshly removed carcinomata produced apparently beneficial results in dogs and in human beings. The evidence in favor of the beneficial action claimed is slim, of course, but the results above mentioned would seem to justify fully further efforts in the same direction.

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[1] Centralblatt f. Bakt., 1902, xxx., 945–948.

[2] Centralblatt f. Bakt., Ref., 1902, xxxi., 503.

[3] Compt.-rend. de Soc. Biol., 1902, liv., 15, 16.

[4] Hospitalstidende, 1902, xlv., 489–502.

[5] Deutsche med. Wochenschrift, 1902, xxviii., 637, 638.

Cancer Statistics and the Increase of Cancer. A number of articles have appeared dealing with statistical figures and their significance in regard to cancer. While the general import of the results seems to be that cancer is on the increase, the complexities and difficulties connected with this form of study render it quite impossible to establish many absolute facts. De Bovis,[1] of Rheims, finds no support from his figures, and they are elaborate, for the view that cancer is increasing. On the other hand, Writzdorff,[2] Aschoff,[3] and Kobb present figures that show an evident increase in various parts of Germany. Mason's[4] statistics show increase, and lead him to believe that cancer is caused by organisms in sewage contaminated subsoil. De Bovis[5] presents an elaborate study of the accessory factors in the cause of cancer, but the paper is so full of details that it does not lend itself to a summary statement.

Classification and Nomenclature of Tumors. White[6] abandons the embryogenetic classification of carcinoma in favor of one based on histological grounds. He establishes organ tumors—organomata—the present dermoids and teratomata; tissue tumors—histiomata—the present benign tumors, and the cell tumors or cytomata, the present malignant tumors. Adami,[7] on the other hand, attempts to readjust the embryogenetic classification so as to bring it into accord with our present knowledge. He classifies the tissues as lining membrane tissues (lepidic—*i. e.*, rind) and as pulp tissues (hylic—*i. e.*, crude). Thus the various glandular organs are formed from the primitive lining membranes—epiblast, hypoblast, and mesothelium—while the mesenchyme forms the stroma.

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[1] Semaine Médicale, 1902.

[2] Deutsche med. Wochenschrift, 1902, xxviii., 162–166.

[3] Klin. Jahrbuch, 1902, viii. (abstract in Centralblatt f. Bakt., 1902, xxxii., 105).

[4] British Medical Journal, January 18, 1902.

[5] Semaine Médicale, 1902, xxvii.

[6] Lancet, February 15, 1902.

[7] Journal of Pathology and Bacteriology, 1902, viii., 243–259.

Miscellaneous Observations in Regard to Malignant Tumors. Honda[1] made use of wax reconstructions as recommended by Hauser, and Petersen, in the study of formation of *carcinomatous metastases.* The method gives clearer pictures than are obtainable from the study of sections. Like Petersen, Honda also finds that the further growth of small metastases in the liver is the result of a continuous growth of the epithelium, which in reality forms a connective mass. Petersen, who first began the systematic study of the growth of carcinoma by the wax modelling method,[2] distinguishes between the unicentral and multicentral forms of growth in primary carcinoma of the skin. A multicentral carcinoma corresponds exactly to a group of primarily multiple carcinomata. The importance of scattered centres of this sort for the explanation of recurrence has been mentioned.

Ernst[3] shows that carcinoma cells may spread in the lymph vessels of peripheral nerves, and that this natural injection may prove of value for the study of the lymphatics of nerves.

Schwalle[4] in several *carcinomata of the liver,* primary as well as secondary, found well-marked reactions for iron (hæmosiderin) in the cells and in the stroma. He excludes hemorrhage and passive congestion as the source of the iron, and believes that it is deposited in the cells by virtue of functional activity of the cells. This explanation is fairly well applicable to primary carcinomata of the liver, but in the case of secondary growth he is forced to assume a sort of adaptation of the cells to the location.

Sutter[5] describes and interesting case of primary carcinoma with *metastases in the testicle and penis* ascribable to retrograde transport through the spermatic vein. He notes that the bacillus of tuberculosis may occasionally follow the same route; this would explain better the peculiar arrangement of the lesions in some cases of urogenital tuberculosis.

Frank P. Anzinger[6] contributes a study of the *changes produced in striped muscle by invading malignant tumors.* He finds, contrary to Schaeffer and Fujinami, that in sarcoma retrograde changes are slight or absent, but in carcinoma marked. In carcinoma, atrophy and other retrograde changes may occur at such a distance from the tumor that the influence of toxic substances or of withdrawal of nutrition is suggested. There is nothing specific in the character of the muscle changes produced by malignant tumors. The various forms of retrograde and regenerative changes, the former being of course the predominating, are described thoroughly.

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[1] Centralblatt f. Path., 1902, xiii., 304–309.

[2] Beiträge z. klin. Chirurgie xxxii.

[3] Verh. d. path. Gesellsch., 1902, iv., 236–239; also Gureurtsch., Inauguration thesis, Zurich.

[4] Centralblatt f. Path., 1901, xii., 874–881.

[5] Virchow's Archiv., 1902, clxviii., 305–340.

[6] Journal of American Medical Association, 1902, cxxiii. 268-283.

Treutlein[1] makes out that *metastatic pulmonary tumors*, especially sarcomata, may spread throughout the living tissue by way of the alveoli by passing through interalveolar pores described by Kohn.

Fütterer[2] gives a résumé of the facts which necessitate a modification of the definition of the term tumor as a growth without function. Fütterer cites the digestion of boiled egg albumin with an extract of a gastric carcinoma. I would remark that the presence of digestive ferments in tumors is probably not uncommon. In a cystic sarcoma the fluid had well-marked peptic properties, and such cystic softenings are good examples of autolysis. Fütterer reports a case of secondary carcinoma in the stomach that originated by implantation from a carcinoma of the œsophagus; he finds only six cases of *secondary carcinoma of the stomach* of similar genesis. To the other fewer instances of this variety of metastasis in the respiratory tract, he adds one of growths in both lungs from a thyroid carcinoma. Fütterer recommends experiments looking to the production of carcinoma with epithelial cells which have suffered alterations accompanying chronic inflammation.

Gliomata and Ependymal Tumors. Mallory[3] describes three gliomata of ependymal origin. Two occurred in the fourth ventricle, and the cells of both contained the peculiar markings observed in ependymal cells when stained with Weigert's neuroglia method. The third tumor was situated subcutaneously over the coccyx and had a carcinomatoid appearance, but between the epithelioid cells, which occurred in masses, occurred fibres staining by the differential neuroglia methods, and, furthermore, many of the cells contained the peculiar markings just mentioned. For this reason this, like the other two tumors, is referred to an ependymal origin.

Saxer[4] describes a *glioma of the right hemisphere*, in which were cysts lined with ependymal cells, and also several other interesting tumors of the central nervous system, including a papillary tumor of the lateral ventricle springing from the ependyma. He emphasizes that there are tumors in the brain of ependymal origin, but without trace of neuroglia formation. Some of these (von Wunscheim's case) may develop into typical carcinoma. All of these tumors have a marked tendency to calcification. Saxer explains the lining of cysts in glioma as due to a transformation of neuroglia cells into the closely related epithelial

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[1] Compt.-rend. de Soc. de Biol., 1902, xiii., 520–522.

[2] Medicine, 1902, viii., 177.

[3] Journal of Medical Research, 1902, viii., 1–10.

[4] Ziegler's Beiträge, 1902, xxxii., 276–305.

(ependymal) cells, and he does not favor the importance assigned to anomalies in the explanation of syringomyelia.

Fischer[1] describes a glioma (glioma sarcomatodes) of the cord that extended through the vertebræ and formed metastases. He claims by modification of ordinary methods to have demonstrated glia fibres in the extraspinal parts of the tumor.

Brown Pusey[2] describes a tumor of the retina containing rosettes composed of neuroglia cells and fibres. Pusey believes that the old term, *glioma of the retina,* ought to be retained, because more in accord with the facts than Wintersteiner's new name of neuroepithelioma retinæ.

Hypernephroma. J. C. Ohlmacher[3] describes a malignant hypernephroma of the kidney which he traces to the adrenal medulla because the arrangement of the reticulum, the character of the cells—large, polyhedral, with large nuclei—the presence of widened venules, and sinuses correspond well to the conditions in the normal medulla. In this case there were numerous metastases in various parts of the body.

According to Croftan,[4] the watery extracts of hypernephromata may produce glycosuria in rabbits when injected into the muscles, corresponding in this respect to adrenal extract as demonstrated by Herter and others. The extracts of hypernephromata also contain a diastatic ferment that changes starch or glycogen into maltose and dextrose. This ferment is destroyed by boiling. Such extract also decolorizes starch solution made blue by the addition of iodine. These reactions, especially the last, which may be made with material from hypernephromata preserved in formalin, are recommended by Croftan as means of rapid diagnosis of hypernephromata, the cells of which correspond in function to those of the normal adrenal. Twenty grains of fresh tissue may be reduced to pulp and extracted with 100 c.c. of water, and mixed with a 1 per cent. starch solution ; the addition of a drop of dilute alcoholic iodine solution gives a momentary blue color, changing to rose-red, and disappearing shortly. The matter should be investigated further. The application of chemical methods of study to other tumors—*e. g.*, thyroid—would, no doubt, yield valuable results.

Myeloma and Other Tumors of Bone-marrow. Wieland[5] reviews the whole subject of primarily multiple tumors in the bone-marrow, of which there are three principal groups, namely, myeloma,[6] myelogenic sarcoma and lymphosarcoma, and endothelioma. These forms of tumors are distinguishable histologically but not clinically. Wieland reviews the German literature quite thoroughly, but neglects wholly everything concerning this subject in the English language, except a reference to Bence-Jones' original article "On a New Substance Occurring in the Urine of a Patient with Mollities Ossium."[1] Wieland describes five tumors that consisted of isolated, more or less densely arranged, mostly small round cells, with occasional spindle cells, surrounded by a delicate, finely granular or fibrillar intercellular substance —a structure resembling that of adenoid tissues in general.[2] Wieland found nine additional similar cases in the literature. In some of these nine cases *albumosuria* was present, showing that the symptom is not referable only to myeloma, which he would limit strictly to circumscribed growths in the marrow of the same structure as the latter (homoplastic). Lymphosarcomata of bone-marrow may extend to adjacent tissues, but not as a rule, and metastases are very rare. The clinical symptoms of many of the cases have been indefinite. In some of the cases, as, for instance, in Wieland's two latest, the growths were found only after death. In other cases there have been observed fractures of the spine and the sternum, and spontaneous fractures of ribs.

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[1] Zeitschrift f. Heilkunde, xxii.

[2] Bulletin of Johns Hopkins Hospital, 1902, xiii., 229-234.

[3] Journal of Medical Research, 1902, vii., 421-427.

[4] Virchow's Archiv., 1902, clxix., 232-235.

[5] Ibid., 1901, clxvi., 103-157.

[6] See PROGRESSIVE MEDICINE, March, 1901, 361, 362.

W. G. MacCallum[3] describes a case of multiple myeloma whose cells had the form and several characters of the bone-marrow cells minus the specific granules of the myelocytes, but possessing the peculiar nuclear structure of the myelocite and its antecedent, the non-granular marrow cell. The myeloma cells lack certain essential peculiarities of plasma cells, and it seems quite correct to regard them as derived from the large non-granular cells of the marrow.

Chondroma. Spuler[4] studied the structure of chondromata especially by means of the orcein and Weigert methods for elastic tissue. He finds that fibrillæ occur in the ground substance of undegenerated hyaline chondroma tissue, the intervening spaces being filled with chondromucoid material.

Moles and Melanotic Tumors. Abesser[5] summarizes the results of an investigation which he made in Orth's laboratory concerning the much disputed origin and significance of the cell masses in cutaneous nævi, as follows: 1. All nævus cells, including the branching pigment cells, are derived from the epidermis. The transformation is associated with loss of the fibrillation of epithelium. The separated cells are not changed into connective cells, but retain their epithelioid character.

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[1] Transactions of the Royal Philosophical Society of London, 1848.

[2] These were also described by Wieland in 1893 in an inaugural dissertation.

[3] Journal of Experimental Medicine, 1901, vi., 53–63.

[4] Ziegler's Beiträge, 1902, xxxii., 253–265.

[5] Virchow's Archiv, 1901, clxvi., 40–66.

Melanotic tumors arising in nævi are consequently to be regarded as nævo-carcinomata.

Abesser points out that the Italian, Durante, in 1871, and not Unna, as currently supposed, was the first to advance the view that nævi are epithelial in origin and not mesodermal, as claimed by Rokitansky and Virchow, and that Durante upon this basis proposed an embryonal theory for tumors, which Cohnheim quite independently three years later brought forward. More recently (1893) Unna, without knowledge of Durante's views, urged the genesis of nævi in epithelium, and since then, especially of late, much has been written for and against this view. Abesser selected preferably very small nævi, and examined them in serial sections. As the type of fully-developed nevus cells he mentions round or oval cells with vesicular nuclei and clear protoplasm, with little staining power, but smaller, flattened cells as well as branching and polymorphous pigment cells (chromatophores) also occur. A second characteristic of nævi is proliferation of the epidermis, and the third is a peculiar transformation with softening of the epidermal cells into cells with irregular outline often connected with one another and with adjacent typical epithelial cells by fine threads. This metaplasia occurs not only at the periphery of the epithelial columns, but also in the interior of the latter. The changed cells are then loosened from their connections, and may again assume a rounded outline at the same time as they lose the fibrillation. During the process of separation several cells may run together into giant-cells with vacuolated margins.

Abesser also traces the branching chromatophores to separated epithelial cells, but the origin of the smaller, flattened cells he cannot trace satisfactorily. Later, connective tissue and elastic fibres grow into the cell heaps from without.

In spite of the convincingness of the appearances described by Abesser as demonstrating the origin of nævus cells in the epidermis, the unquestionably sarcomatous behavior of the malignant tumors springing from nævi suggests strongly that pigmented moles may take their origin from aberrant mesodermal cells misplaced into the lower layers of the epidermis, whence they break loose and enter the cutis. The question is still worthy of further careful study, especially of nævi in the newborn, at a time when the lesions are developing.

Larass[1] has studied *melanotic tumors*, with special reference to nævi and their origin. Like Abesser, he traces the point of origin of the nævus cells to the epithelial layer of the skin. He further shows that such epithelial nævi may be the starting point of epithelial melanotic tumors. From a study of suitable cases he reaches the opinion that true melanotic tumors develop only in such parts of the body as normally contain melanotic pigment (skin, eye, pia mater). Hemorrhagic pigment tumors must be carefully separated from true melanotic growths.

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[1] Arbeiten aus der Pathologisch-Anatomischen Abtheilung des Königl. Hygienischen Instituts zu Posen (Professor Lubarsch), 1901, 66-96; also Dissertation, Leipzig, 1901.

H. C. Low and F. B. Lund[1] review the subject of tubular perisarcoma and describe an instance of melanotic tumors of the skin, starting in moles, the metastases, however, assuming the types of perivascular angiosarcoma—another instance of the sarcomatous type of tumors of this kind which Abesser and Larass, following Unna and others, insist are carcinomatous.

Katsurada[2] describes an extensive pigmentation of the capillary endothelium of the brain in an extensive melanosarcomatosis, the primary tumor being situated in the hard palate.

The danger of meddling with moles is emphasized by Jaboulay,[3] who cites cases of diffuse melanosis following directly upon pricking, squeezing, and scarifying small nævi. "There lurks in the cells of pigmented moles a hidden potency for malignant growth that cannot receive too much attention."

Wood and Pusey[4] have made a monographic study of sarcoma of the iris. Of much value is the deduction derived from their study of the cases in the literature, that the best mode of treatment is enucleation of the globe, because of the great liability of extension having taken place to other structures than the iris without this being recognizable macroscopically.

Chorio-epithelial Formations in Teratomata of the Testicle. The most interesting development in connection with teratoma and with chorio-epitheliomata is the demonstration by Schlagenhaufer[5] and Wlassow,[6] independently of each other, that teratomata of the testicle may contain syncytial masses and hydatidiform-like structures. Schlagenhaufer discusses the important finding very thoroughly. He points out that the first attack upon Marchand's claim of the specificness of chorio-epithelioma as a tumor connected with the pregnant uterus came from England. Kantach and Eden showed a committee of the Pathological Society sections of secondary growths in the liver and lymph glands from a case of sarcoma of the testicle containing precisely similar large cells and syncytial masses as the chorio-epithelioma. Later Lubarsch reported a tumor from the genital tract of a virgin girl, aged thirteen years, who had not menstruated, that also showed the picture of chorio-epithelioma. Schlagenhaufer then refers to two cases of sarcoma of the testicle, one described by Langhans, who mentions the occurrence in it of chorionic villi-like structures, and the other by Malassez and Monod, whose descriptions are particularly valuable. Just at this point I wish to refer to the report by Wlassow of similar tumors which he designates as epithelioma syncytiomatodes testiculi. He also refers to the fact that Malassez and Monod some years ago described a peculiar tumor of the testicle, which they designated as angioplastic sarcoma, because of its resemblance in general to vasoformative tissue, the continuous sheets or masses of anastomosing giant cells with vacuoles that often contained blood corpuscles being regarded by them as incompletely developed vessels. Since then Carnot and Marie and Dopter have described similar tumors. Wlassow reports that he has had the opportunity to study a number of cases of this form of tumor, which probably is not so rare as the scantiness of the literature would indicate. Wlassow finds the histological structure, of the metastases especially, quite identical with that of chorio-epithelioma in having no alveolar structure and no distinct stroma, and after much search he succeeded in establishing to his own satisfaction that Malassez and Monod's angioplastic sarcoma really is of epithelial origin, and that the giant-cells, instead of forming vessels, in reality are destroying them. In view of the morphological identity of this tumor with the chorio-carcinoma, Wlassow attempts the suggestion that it may develop from the hypoblastic chorion of an embryoma (teratoma) of the testicle. At all events, he regards the tumor as "an epithelioma sui generis of the testicle," developing from incompletely differentiated epithelium.[1]

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[1] Reports of Boston City Hospital, 1901, xii., 168–201. Journal of Medical Research, 1902, vii., 83–113.

[2] Ziegler's Beiträge, 1902, xxxii., 193–195.

[3] Semaine Médicale, 1902.

[4] Archives of Ophthalmology, 1902, xxxi., 323–383.

[5] Wiener klin. Wochenschrift, 1902, xv., 570–580, 604–606.

[6] Virchow's Archiv, 1902, clxix., 220–240.

Schlagenhaufer reports in full with illustrations a "sarcoma testiculi" with metastases from a man, aged forty-three years. The metastases have the same brownish-red color as those of chorio-epithelioma. The microscopic examination showed that it concerned a teratoma—there were structures from all three germinal layers—but in various parts the appearances so resembled chorio-epithelioma that if the source of the tumor had been unknown, the unhesitating diagnosis would have been chorio-epithelioma. Schlagenhaufer would explain the occurrence of chorio-epitheliomatous structures in these tumors of the testicle as due to the inclusion during development of remnants from fœtal membranes, more particularly the epithelial lining, as postulated by Bonnet in his theoretical consideration of the origin of teratomata. The occurrence of similar structures in teratomata of the ovaries is, of course, possible, and here the same explanation would hold.

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[1] The literature on ordinary chorio-epithelioma malignum is collated by Münzer in Centralblatt f. Path., 1902, xiii., 197-265.

Hydatid moles, myxomatous degeneration of chorionic villi, are often associated with chorio-epitheliomata, and Schlagenhaufer points out that in accord with the demonstration of chorio-epithelium in teratomata hydatidiform-like structures might be expected to occur in such tumors also. And, indeed, there are several cases of peculiar tumors of the testicle in the literature that are cited by him as examples of this interesting phenomenon (Waldeyer, Breus, Kanthach and Pigg, Silberstein, MacCallum[1]). In the descriptions of these authors reference is made frequently to the similarity of the structures present in the tumors, especially certain intravascular formations, to the myxomatous villi of hydatid moles. Thus, MacCallum says of masses in the veins: "These curious formations resemble nothing so much as the villi of hydatidiform moles." This is also shown macroscopically by a drawing from Breus' case accompanying Schlagenhaufer's article of the tumor masses in the heart and large vessels. Schlagenhaufer believes that in these cases it concerned a myxomatous (hydatidiform) degeneration of intravascular chorionic villi in teratomata of the testicle containing more extensive parts of the fœtal membranes, the derivatives of which, during the growth of the tumor, make their way into the bloodvessels. A re-examination of material from Breus' case shows that it concerns a teratoma, that the hydatidiform growths in part correspond to hydatid moles, and then that metastases show chorio-epitheliomatous areas produced by proliferation of the covering of the villous masses. Hence the general conclusion drawn by Schlagenhaufer from this review of the subject is that teratomata may contain not only chorio-epitheliomatous areas, but also hydatidiform structures.

H. W. Carey[2] found syncytial and decidua-like cells in a teratoma of the testicle. Carey also gives a review of twenty-four cases of testicular teratoma from the literature of recent years. Testicular teratomata may become malignant by growth along blood or lymph vessels of derivatives of one or more of the germinal layers. Teratoma may coexist with a malignant growth starting in the tubules of the testicles.

Teratoma. Traina,[3] in Foa's laboratory, made an extensive series of experiments with the implantation of embryonal tissues into the ovaries. The animal used was the guinea-pig. Minute pieces from early embryos were inserted into the ovaries of adult animals, and the resulting processes studied after varying intervals. Pieces containing embryonal bone or cartilage grew, retaining the power of bone formation, so that after some time smaller and larger pieces of bones were found in the ovaries experimented upon. Pieces of embryonal skin grew into small cysts similar to dermoid cysts. Many of the ovaries experimented upon contained small cysts which Traina regards as follicular in origin. It seems that the ovary is an exceptionally favorable place for experiments of this kind, the implanted pieces growing better than elsewhere. This circumstance Traina ascribes principally to the vascularity of the ovary. Traina regards his results as favorable to the theory that ovarian dermoids and teratomata are the result of inclusion of embryonal tissue.

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[1] See PROGRESSIVE MEDICINE, March, 1901, 363, 364.

[2] Bulletin of Johns Hopkins Hospital, 1902, xiii., 268–279.

[3] Archiv per. le Laenze med., 1902, xxvi., 13–52.

Engländer[1] uses an instance of teratoma of the omentum composed only of derivatives of the two inner layers of the embryo to show the inadequacy of the hypothesis of Wilms, Bandler, and Bonnet in regard to the origin of teratomata. Wilms' theory of parthenogenesis is not accepted on general principles, and in this instance it would not be applicable in any case, because it postulates the presence of derivatives from all three layers. So does Bonnet's theory of the separated blastomere. And Bandler's theory of the origin of teratomata in remnants of the Wolffian body is not applicable, because of the absence in this case of epidermal structures such as that theory postulates. Engländer assumes that in the course of early development a few cells of the entoderm and mesoderm were shaken loose in some way, and subsequently proliferated to form the tumor according to Cohnheim's theory. It seems to me that it would be difficult, in a case of this sort, to exclude conclusively all possible ectodermal derivatives.

Glinski[2] describes a polypoid tumor in the lower part of the œsophagus, composed of a mixture of tissue elements, including striated muscle fibres. A similar case has been described by Wolfensberger.[3] Glinski would explain these tumors on the basis of Wilms' theory of remnants of embryonal tissue of indifferent cells, because he found in the tumor "indifferent" cellular embryonal tissue.

Huguenin[4] describes a tumor of the testicle containing islands of cartilage, glandular tubules, and epidermal areas. He traces the tumor to disturbances in connection with the early development of the Wolffian duct.

Other interesting examples of this class of tumors are described by Laxer[5] (bladder), Borsch[6] (sacral tumor of the cerebral structure), and others.

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[1] Centralblatt f. Path., 1902, xiii., 393–405.

[2] Virchow's Archiv., 1902, clxvii., 383–396.

[3] Cited by Glinski.

[4] Ibid., 396.

[5] Verh. path. Gesellsch., 1902, iv., 202.

[6] Ibid., 197–200; and Ziegler's Beiträge, 1902, xxxi., 419–430.

LARYNGOLOGY AND RHINOLOGY.

By A. LOGAN TURNER., M.D.

SUBCUTANEOUS PARAFFIN INJECTIONS IN THE CORRECTIONS OF DEFORMITIES OF THE NOSE.

During the last two years the attention of surgeons has been directed by no means infrequently to the employment of subcutaneous paraffin injections. As we shall see presently, the uses to which this therapeutic agent have been put are varied, and, in view of its increasing importance in surgery, it will not be out of place to briefly sketch its history and development in this connection. While the name of the Viennese surgeon, Gersuny, is most prominently associated with its introduction into surgical practice as recently as 1900, and while not only its possibilities but also the improvements in technique are the result of his work, it is only just to give to Corning, of New York, the credit of having first employed paraffin subcutaneously. In 1891 he published a paper on "The Localization of Remedies About the Sensory Nerves of the Skin,"[1] in which he advocated the introduction of certain medicaments under the skin, and brought about their more prolonged retention at the seat of injection by immediately introducing a solidifying oil. The injection of the latter caused occlusion of the bloodvessels and prevented immediate absorption of the drug employed, as, for example, a local anæsthetic. About the same time Corning recognized the fact that fat with a higher melting point might solidify and remain permanently in the tissues, and he carried his principle into practice by injecting a muscle in a state of spasm with oil, in this way arresting the convulsive condition.[2] At a still later date[3] he further developed his ideas upon this subject by introducing a solidifying oil between the divided ends of certain sensory nerves in order to remove neuralgic pains. The nerves were divided subcutaneously by a small knife, to the back of which a canula was attached, so that division and injection were almost simultaneous.

In the year 1900, nine years after the publication of Corning's first paper, Gersuny reported the result of his operations with paraffin injections under the title "Ueber eine subcutane Prothese."[1] He there explained that when melted vaseline is introduced into the soft tissues it solidifies and forms a small mass, which remains *in situ*, without giving rise to any inconvenience. The first case in which Gersuny used paraffin in this way was that of a man from whom both testicles had been removed for tuberculous disease. Two masses of paraffin were afterward inserted into the scrotum, to the entire satisfaction of the patient. In the same paper other cases were recorded where this agent was employed for different purposes, including some for the correction of saddle-nose deformity. Although our main object in this review is to demonstrate the advantages to be derived from the injection of paraffin in nasal deformities, we may mention here some of its other surgical applications. Gersuny, Kapsammer, and Pfannenstiel have treated cases of incontinence of urine in females after destruction of the sphincter muscle with satisfactory results, while Halban has used it in prolapse of the anterior vaginal wall. Paraffin has also been inserted after removal of a cancerous tumor of the rectum, where the sphincter action of the bowel has been impaired. After amputation of the mamma an attempt has been made to improve the configuration of the breast, and for a similar purpose it has been utilized in cases of retraction of the thorax, after resection of ribs, after removal of the upper jaw, and even to improve the appearance of smallpox pitting. Eckstein used paraffin to fill up the gap in two cases of palatine fissure. Alt[2] has obtained favorable results in plastic operations upon the ear, filling up a permanent opening after a mastoid operation for cholesteatoma, and, again, in a case of destruction of the cartilage of the pinna from perichondritis, followed by shrinking and deformity. Rohmer introduced a mass of paraffin into the orbital cavity after enucleation of the eyeball, to serve as a cushion upon which to place the artificial eye. Even this list hardly exhausts all the uses to which it has been put. Lastly, we may mention what a useful agent it would probably be in the correction of deformities following the removal of the anterior wall of the frontal sinus in the attempt to obliterate that cavity. With regard to its most recent employment as a submucous injection in the treatment of ozæna we shall refer elsewhere.

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[1] New York Medical Journal, December 26, 1891.

[2] Ibid., April 14, 1894.

[3] New York Medical Record, December 5, 1896.

If we may judge, therefore, from the increasing number of papers that are being published and the varied uses to which paraffin has been put, it is evident that, with due attention to the employment of a pure preparation and to a proper technique in its use, it will probably prove to be a very serviceable therapeutic agent in the treatment of superficial deformities. In dealing with a substance of this nature, which is readily influenced by changes of temperature, one naturally considers whether it can remain permanently in the living tissues and what changes are brought about at the site of the injection in order to insure its permanency. Experiments have been made on animals by several observers, with a view to elucidate these points. It appears doubtful whether a true comparison can be made between the results obtained experimentally in the lower animals and those which actually take place after a paraffin injection in the human subject. Thus Juckuff has made a series of inoculations in rabbits, guinea-pigs, and pigeons, using in some liquid paraffin and in others a mixture of liquid and solid paraffin, with a melting point varying from 32° C. to 36° C. He concluded that paraffin and, indeed, all non-watery fluids are not taken up by the lymphatic vessels. Watery fluids injected subcutaneously, by separating the connective tissue fibres, form a space for which they are taken up into the lymph vessels by capillarity. Non-watery fluids, on the other hand, offer opposition to absorption ; owing to a stronger cohesion of their particles they do not pass from the wide spaces into the narrow capillaries. They spread only in the interstices of the looser connective tissue, and, following the law of gravity, they reach the deeper parts. At the same time, however, they give rise to a growth of the surrounding tissue, so that the latter grows through the paraffin and converts it into a meshwork. Small pieces are cut off by the new connective tissue, and, finally, the foreign body, which has resisted absorption for a very long time, is converted into a form of emulsion which is capable of being taken up by the lymph vessels and carried to the glands.

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[1] Zeitschrift f. Heilk., Berlin, 1900, Bd. i. Heft. 9.

[2] Monatschrift f. Ohrenh., Berlin, September, 1901.

Moszkowicz,[1] commenting upon Juckuff's experiments upon animals, draws attention to the fact that a large quantity of paraffin was used in proportion to the body weight of the animals in which powerful skin muscles existed. In consequences of the latter fact, one cannot be surprised that a foreign body should wander in the looser tissues as the result of muscular contraction. The same thing may be observed in the human subject before encapsulation takes place, if paraffin be injected into the loose tissue of the scrotum or eyelid, in both of which areas muscular contraction takes place. As a foreign body in the tissues, the paraffin sets up a connective tissue cell growth. The granulations traverse the mass in a manner similar to that in sponge implantation, and small portions are cut off from the piece originally introduced. Very gradually connective tissue fibres are formed. Moszkowicz found in the ear of a rabbit, three months after injection, a central mass of vaseline firmly encapsulated, and in its neighborhood a number of very small pieces of the same substance surrounded by connective tissue cells. The cells lying immediately in contact with the vaseline were flattened and resembled endothelial cells, thus suggesting to the observer that the material lay in the lymphatic capillaries. A very slight reaction followed the experimental operation, as evidenced by a transient hyperæmia and œdema.

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[1] Wiener klin. Wochenschrift, 1901, No. 25.

Harmon Smith,[1] of New York, had the opportunity of examining the seat of injection in a rabbit which died from other causes ten days after the experiment had been carried out. There was no tendency for the paraffin to gravitate, and there was an evident attempt toward encapsulation, while the paraffin itself formed a hard mass which presented no obvious change. The inertness of the injection was evidenced by the absence of any inflammatory signs. In another rabbit, killed twenty-two days after the operation, very similar changes were found, and Smith is inclined to the view that the encapsulation was more of a mechanical than of an inflammatory character.

The question of the absorption of the injected material is, of course, one of very considerable importance, as the permanent result of the operation is dependent upon its occurrence or non-occurrence. So far as the treatment of deformities of the nose is concerned, a sufficiently long period has not yet elapsed to permit of any authoritative pronouncement being made upon this point; but if the paraffin becomes encapsulated and exists as a firm mass some months after its introduction, it is only reasonable to suppose that it will remain permanently in this condition. Both Pfannenstiel and Halban have reported a case of pulmonary embolism following paraffin injection at the neck of the bladder. This accident has been ascribed by Gersuny to the employment of a paraffin with too high a melting point, while others have blamed its introduction directly into a vein.

The question of absorption, and, indeed, the secret of the success or failure of the operation, depend largely upon the kind of paraffin used and the whole technique of the procedure; it is to these points that we must now turn. Perusal of the various writings dealing with this subject show clearly enough that paraffins having different melting points have been employed. Thus, Gersuny himself used white vaseline or the unguentum paraffin, a mixture of solid and liquid paraffin, a substance having a melting point of 36° C. to 40° C.—*i. e.*, 97° F. to 104° F. Certain objections have been raised to the employment of vaseline, on the ground that it remained liquid for some hours after its injection into the tissues, and might, therefore, give rise to embolism;

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[1] New York Medical Journal, May 17, 1902.

further, that infiltration into the neighboring tissues was possible for some little time after its introduction. It has also been asserted that a slow absorption of this material was possible, and that consequently a permanent improvement was not to be expected from the operation. Still another drawback presented itself, in the fact that the melting point of the vaseline used by Gersuny was relatively so little above the normal temperature of the human body that the individual might readily, under the influence of some marked feverish condition, acquire a temperature equal to or higher than the melting point of the vaseline. The consequence of this is sufficiently obvious. Eckstein,[1] of Berlin, believing that, in the use of paraffin just referred to, the best and most durable results were not obtainable, has employed a solid paraffin having a higher melting point—*i. e.*, from 60° C. to 65° C. (120° F. to 130° F.). This substance, therefore, has a melting point considerably higher than that of the medium into which it is injected, consequently it solidifies very rapidly, and thus remains in the same situation uninfluenced by muscular contractions or other forces; the risk of embolism, too, is avoided, and variations in the temperature of the human body will not affect the durability of the mass as it lies in the tissues. Broeckaert, of Ghent, who was the first to give any descriptive account[2] of Eckstein's modification, has more recently[3] modified that procedure. He prefers to use a paraffin melting at 56° C. to one which does so from 60° C. to 65° C. At the latter temperature he considers that the tissues are exposed to the risk of being burned and necrosed, with the subsequent formation of a cicatrix—a point of very considerable æsthetic importance when dealing with the skin of the nose. In reading the accounts of a number of reported cases one finds, therefore, that the actual temperature of the injected fluid is by no means a constant one. Paraffin with the higher melting point is, however, preferred, and in the majority of cases Eckstein's method is employed. Gersuny has got rid of some of the objections which have been taken to his method of injection. We read in an interesting paper by Moszkowicz[4] that he now injects the vaseline (unguentum paraffin) in a solid state. After melting and drawing it into the syringe, he there allows it to cool down until solidification takes place, and then, in the form of a fine thread, he injects it into the tissues. From the point of view of convenience it is possible that paraffin, having a melting point of 110° F. or 115° F., will give excellent results, inasmuch as it is free from the disadvantages of that possessing a low melting point, and is more easily manipulated than paraffin with a higher melting point. The paraffin must be thoroughly sterilized. Paraffin preserved in sealed bottles after the manner of antitoxin serums may be employed, the sterilizer in which the syringe is boiled also serving as a water-bath in which to melt the paraffin. The amount of the material to be used will vary in different cases, but it is necessary to avoid introducing any excess, as undue tension and destruction of the skin may follow. It is better to repeat the operation on several occasions if the need arises. Half a drachm to one drachm or one and one-half drachms will probably be found a suitable quantity. An ordinary antitoxin syringe suits the purpose, and this also must be boiled and rendered aseptic. A shorter needle possesses an advantage, from the fact that there is not so much risk of the paraffin cooling as in the case of a long needle. One of the main difficulties met with in the technique of the operation depends upon the rapid cooling of the syringe and consequent solidifying of the paraffin. With the introduction of the paraffin in the solid state, however, as practised by Gersuny, this difficulty should not have the same prominence. The syringe should be kept in hot sterilized water immediately before use, and there should be no delay in carrying out the injection. If the syringe is cased in rubber tubing the heat will be to some extent preserved. Walker Downie was able to keep his needle at a proper temperature by means of an electric current.[1] Quinlan,[2] of New York, has fitted on to an ordinary antitoxin syringe a metallic hood or jacket through which a stream of water heated at 118° F. to 125° F. is allowed to circulate. The hood is fed by an inlet aperture from a vessel raised a little distance above the operator, while a piece of tubing attached to the outlet opening carries the water into a receptacle.

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[1] Choussaud, Revue hebd. de Laryngol., Paris, 1902, No. 13.

[2] Revue hebd. de Laryngol., Paris, 1901, No. 49.

[3] Ibid., 1902, No. 27.

[4] Wiener klin. Wochenschrift, 1901, No. 25.

The skin of the nose and the surgeon's hands must be carefully cleansed, because it is just as important to obtain asepsis here as it is in larger operations. The question of employing a general or local anæsthetic may be very briefly considered. There does not appear to be any necessity for the former, as the discomfort caused by the injection is, as a rule, slight. While some operators make a preliminary injection of cocaine, and have even employed Schleich's mixture, in the majority of cases the patient is able to tolerate the pain that is produced. It has been suggested that the tissues should be prepared for the reception of the paraffin by first incising the skin, and then, by means of a probe, breaking down the connective tissue, and thus forming a cavity. Such a procedure is quite unnecessary, and would only occasion a certain amount of hemorrhage.

The skin may be previously warmed by the application of hot sterilized gauze. The site for the puncture having been chosen, a fold of the skin should be raised between the finger and thumb of the left hand, if that is possible, and the needle inserted into it, and the paraffin gently introduced without any undue pressure being exerted. During the injection the material is moulded according to the necessities of the case. Its plasticity only remains for one or two minutes. In order to prevent the risk of the paraffin spreading beyond the required area—in more than one case it has reached the eyelids—an assistant may exert pressure upon the skin in the immediate neighborhood. It has been suggested that in those cases where the deformity exists at the bridge of the nose—that is, when the nasal bones are depressed—the point of the needle should be directed downward, so as thus to lessen the risk of any diffusion into the upper eyelid. The needle puncture may be sealed by a collodion dressing. As a result of the injection the skin becomes white and presents a somewhat swollen and tense appearance. During one or two succeeding days there is some redness and œdema, which, however, are usually of a transient nature. The application of an iced boric acid dressing will minimize the tendency to any painful reaction. No second injection should be made until all evidence of any local irritation resulting from the previous operation has subsided.

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[1] British Medical Journal, London, May 3, 1902.

[2] Laryngoscope, St. Louis, August, 1902.

On the whole, the results which have followed upon this method of correcting external deformities of the nose are very favorable, and it is probable that we possess in subcutaneous paraffin injections both an elegant and a serviceable mode of treatment. It is extremely simple to carry out, and although the earlier cases in which it has been employed only date from the year 1900, there is reason to believe that the paraffin will remain permanently in the tissues. In this event it will certainly replace the various plastic operations that have from time to time been advocated in the treatment of nasal deformity. Owing to the difficulties experienced by some operators in keeping the syringe suitably warm, and thus allowing the wax to coagulate, the operation has not found favor in certain quarters. Doubtless, too, the possibility that the procedure may not be entirely free from risk—to witness the cases of embolism that have been reported—may bias the surgeon against it. When a new method of treatment of this kind is introduced to the notice of the profession it is not unusual to find it taken up on all sides without due regard to the possible mishaps that may arise in connection with its employment without sufficient attention to detail. The good results that follow are duly chronicled, but frequently we hear nothing of the failures which certainly also occur. If in this instance the operator pays strict attention to the proper technique, and thoroughly appreciates the necessity of carrying out the procedure on aseptic principles, he will not fail to satisfy both his patient and himself.

Quinlan has employed this method in thirty-two cases with only two unfavorable results. One of those was a man of advanced years, with marked syphilitic destruction of the bony and cartilaginous septum of the nose, and an almost complete collapse of the external framework. The other failure occurred in a chronic alcoholic, who developed a slight cellulitis. In one of Choussaud's cases failure to relieve the deformity occurred. In it the skin was adherent to the subjacent tissue, causing a deep transverse groove across the nose. Several attempts to inject the paraffin proved abortive, as it would not penetrate the thickened tissues. Some days later the cicatricial tissue was incised in order to improve the conditions for operation, but this did not answer. The hardened tissues could not be made to rise under the pressure of the paraffin, which in part escaped through the orifices made for the purpose of dividing the adhesions. Suppuration took place, and the paraffin, which had been injected, escaped through the sinus which had formed. In a case with which the writer is acquainted some sloughing of the skin took place. This may have been due to the introduction of too large a quantity of paraffin, or, possibly, to the fact that it was used at too high a temperature. These are some of the possible causes of failure.

OZÆNA.

Notwithstanding the fact that I described the subject of fetid atrophic rhinitis in considerable detail in Volume I. of PROGRESSIVE MEDICINE for 1899, and that Dr. St. Clair Thomson also dealt at some length with the matter last year, no apology seems necessary for again introducing it to the notice of the reader. The etiological factor in the causation of this condition is still a matter of dispute, and, in spite of the immense amount of time that is devoted to the elucidation of the affection, it still appears to baffle both the pathologist and the clinician. This fact fully justifies further reference to the ozæna question, although my main object in doing so is to draw attention to a new method of treatment. Before describing this, however, I wish to refer to one or two papers which have appeared during the last year in which the etiological rather than the therapeutical aspect of the affection has been dealt with.

Grünwald, whose writings upon ozæna must always command careful attention, has recently reviewed the present position of the ozæna question.[1] It is true that his views are sufficiently well known to all rhinologists and hardly require to be quoted at length, but some of his remarks in this paper may be referred to here. In discussing the origin of the secretion he is still of the opinion that in all cases it really arises from focal diseases either situated in the mucous membrane of the nasal chambers themselves or in the accessory cavities. When no such focus can be found it must not be assumed that this is absent. The examination is negative, because of the extreme difficulty there often is in finding the seat of the mischief. One reason for this is to be found in the anatomical irregularities met with in the accessory sinuses; another, in the fact that, while the sinus may present no unusual anatomical formation, the inflammatory infection is of a purely catarrhal type. The diagnosis of this condition is often far from easy. Grünwald also refers to Wertheim's case, in which suppuration of both antra was only found after death to have been the cause of ozæna, every attempt to diagnose a sinus affection during life having entirely failed. In considering the fetor and crusting of the discharge which are so typical of the ozæna condition, he points out that up to the present time none of the organisms hitherto described has fulfilled all the exigencies of a real pathogenesis. There is one point, however, which is worthy of note in this connection, and that is that the bacillus of Abel produces in cultures a gelatinous tough mass resembling the tenacious mucus seen in the nose in ozæna cases. As this bacillus is found principally beneath the true crusts in the sticky mucus adhering to the mucous membrane, it is possible that it does possess a specific relation to ozæna. The toughness of the secretion naturally causes it to become fixed in the nose, where it will lie sufficiently long to become putrid and give rise to the fetid odor so characteristic of the affection. Grünwald details briefly, also, with the atrophy which is present in these cases. While many observers consider this to be the primary source of all the other phenomena, Grünwald has difficulty in finding a reason why atrophy of the whole tissue or even of the mucous membrane alone should produce an altered secretion of this kind. Apparently he is inclined to the opposite view, and would regard the atrophy of the mucous membrane at least to be the consequence and not the cause of the altered secretion—that is to say, the adherent and putrid crusts produce a compression and subsequent atrophy of the underlying mucosa.

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[1] British Medical Journal, London, August 30, 1902.

There is still another point which is referred to by Grünwald in his synopsis, and which has from time to time occupied the attention of several observers. I refer to the question of a possible relationship between ozæna and the anatomical conformation of the nasal chambers. As this has a certain bearing upon the new method of treatment to which I shall presently refer, some reference to this aspect of the subject is called for. Pasmanik's researches on this point were dealt with in Volume I. of PROGRESSIVE MEDICINE for 1902. Minder,[1] working under Siebenmann, has recently published the results of fifty postmortem examinations conducted with the object of considering the measurements of the face and nasal chambers, and, further, the conditions of the accessory sinuses in relation to the ozæna question. Taking this latter point first, we find that Minder's observations do not bear out Grünwald's contention of the frequency of the association of ozæna with sinus suppuration. Seeing that Minder's observations were made on the cadaver, Grünwald's plea that this relationship is not recognized as often as it should be, owing to the difficulties of diagnosis, cannot in this instance be accepted. Of fourteen cases in which the turbinal mucous membrane showed metaplasia of the epithelium, six only had accessory sinus suppuration (42 per cent.). In five cases where ozæna certainly existed, three had sinus suppuration (60 per cent.). These results show a greater frequency of an associated sinus affection than Wertheim, Harke, and Zuckerkandl have demonstrated, but show a smaller percentage than the observations of Bresgen and Hajek. Minder, therefore, joins the group of observers who will not accept the causal relation between accessory disease and ozæna, and puts forward the following reasons in support of his position: 1. The changes in the sinuses are small and recent, while those in the nasal chamber are more advanced and old standing. 2. As a general rule, the ozæna is not influenced by curing the presumably causal empyema. 3. While there are many cases of sinus suppuration only a relatively small number are complicated with ozæna. He would apparently accept the opposite point of view and reverse the relationship, viewing the ozæna as the primary condition and the sinus as a further infection by direct continuity. His autopsies further show that the predominance of sphenoidal and ethmoidal cell suppuration in conjunction with ozæna, as stated by Grünwald, did not exist, the affected sinus being more frequently one of the others.

With regard to the shape of the face and the characters of the nasal chamber, Minder finds himself in agreement with Siebenmann and Grossheintz. In the leptoprosopic face—*i. e.*, where the upper part is narrow—there are, as a rule, narrow nasal chambers (leptorrhinia), while in the broadfaced the chamæ or brachyprosopic the nasal chambers are broad (platyrrhinia). Siebenmann's observations receive still further support from this observer in the fact that metaplasia of the mucous membrane of the turbinals occurs as frequently in leptorrhines as in platyrrhines. In other words, the capacity of the nasal chamber apparently does not influence the origin of the changes in the mucosa.

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[1] Archiv f. Laryng., Berlin, 1902, Bd. xii.

In the same way he found that atrophy was not specially associated with the wide nasal chambers, as it appeared to exist almost more frequently in the narrow type. Siebenmann,[1] in his contribution to the study of true ozæna, states he has observed upon the living that where ozæna is unilateral epithelial metaplasia exists also in the nasal chamber, which is apparently healthy. In cases, however, where deviation of the septum exists—a condition not infrequent in unilateral ozæna—the changes are only met with in the larger nasal chamber—*i. e.*, on the side of the concavity. An observation of this kind, therefore, raises afresh the question of the relation between the origin of ozæna and unusual capacity of the nasal chambers.

Treatment of Ozæna by Paraffin Injections. While we do not profess to have laid any new facts before the reader in the foregoing remarks, it is possible for us to refer to a new line of treatment recently introduced for this distressing affection. So numerous have been the "curative" methods introduced of late that we must naturally regard somewhat skeptically any pronouncement regarding the cure of ozæna. I refer to the submucous injection of paraffin. It is true that in the present instance this therapeutic agent is not brought before our notice under false colors. The statement is made, however, that it would appear to be full of promise, though at the same time it must not be forgotten that only three months have elapsed at the time of publication since the first case was submitted to this line of treatment. Brindel, of Bordeaux,[2] has advocated the introduction of paraffin beneath the mucous membrane of the inferior turbinated bodies. Starting from the hypothesis that roomy nasal chambers constitute an important etiological factor in the production of ozæna, and that the increase in the size of the cavity favors the stagnation, drying, and decomposition of the secretions, Brindel argues that if this retention can be prevented improvement in the condition will result, and points out that the nearer the calibre of the nasal chamber approaches to the normal the greater will the expulsion of the crusts be facilitated, with a consequent amelioration of the disagreeable symptoms. More than that, he considers, may also be expected, as it is possible that a narrowing of the nose may favorably influence the mucous membrane, and thus modify the character of its secretion. In order to bring about such a result he has treated a series of ten cases of ozæna by the injection of paraffin. In this way the atrophied inferior turbinated bodies have been made to assume an appearance of apparent hypertrophy, and the lumen of the nose has consequently become narrowed.

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[1] Zeitschrift f. Ohrenheilk., 1901, lx., 2, 3.

[2] Revue hebd. de Laryng., June 21, 1902.

Reference to the section upon the correction of nasal deformities will acquaint the reader with many of the details of this procedure. The part of the technique which has a special bearing upon submucous injections must, however, be referred to here. The paraffin employed by Brindel was similar to that used by Eckstein, having a melting point from 60° to 65° C. Having thoroughly cleansed the nasal cavity, he applied cocaine to the area of the inferior turbinal. The whole of the needle of the syringe, with the exception of the point, is enveloped in gutta-percha. The uncovered extremity is first heated in the flame of a spirit lamp, and then, under the guidance of the eye, it is passed without delay through the nasal speculum as far back as possible, and then inserted beneath the mucosa of the posterior part of the turbinal. The injection is made slowly, and if the paraffin has not had time to solidify the turbinal becomes re-formed without causing the patient the least pain. Solidification rapidly takes place, and the needle is withdrawn. From two to three cubic centimetres of paraffin are injected into the posterior part of this structure, and if a second sitting is deemed necessary the operation is repeated a little later, so as to complete the reconstruction of the turbinated body. Brindel prefers this method of procedure to the one originally adopted, in which four to five cubic centimetres were injected at one sitting into the inferior turbinates. A satisfactory operation was not carried out in every case, due apparently to the rapid cooling of the needle. This difficulty, however, was overcome by covering the greater part of it with rubber and by using a large rather than a fine needle, the former preserving the heat more effectually. Still another difficulty may arise from the fact that in some of these cases the mucous membrane is bound down to the underlying bone in such a way that the paraffin cannot be forced between the two. Under such conditions it merely falls on to the floor of the nasal chamber when ejected from the syringe. In two of Brindel's cases an unfortunate complication arose, a phlebitis of the facial vein being developed. This complication showed itself two or three days after the injection, the first sign being a painful swelling of the cheek upon the same side and about the inner angle of the eye. Later, a hard cord could be felt, somewhat tender to the touch, extending from the inner canthus of the eye and passing toward the angle of the lower jaw. The condition, however, gradually subsided.

Ten observations are recorded by Brindel, but, as already stated, only three months had elapsed between the date of operation in the first case and the publication of his paper. At the last inspection of the nose there was an absence of fetor, and no abnormal intranasal secretion was present. The author is inclined to regard this method as full of promise. Where the injection could be made the normal topography of the nasal chamber was restored, and not only could the crusts which formed be expelled, but there was an actual diminution in their formation. Nasal respiration also became much easier for the patient.

Richard Lake demonstrated at the meeting of the Laryngological Society of London, March, 1902, a case of atrophic rhinitis in which he had carried out a similar line of treatment. The patient complained that she felt no air passing down her nose—a symptom which appeared to annoy her. This suggested to Lake the idea of contracting her nasal passages by means of submucous injections of paraffin. He introduced the paraffin into the posterior parts of the inferior turbinates, using a needle three inches in length. Cocaine anæsthesia was employed, and at intervals of one week only five minims of paraffin were injected. The patient expressed herself as feeling more comfortable for what had been done.

Delie[1] has also communicated his results arrived at along similar lines. In his opinion paraffin used for this purpose should have a lower melting point than that employed for the correction of the nasal deformity by the subcutaneous method. He, too, found that the procedure failed when, from adhesion of the mucosa to the bone, the needle could not be inserted, and the injection thereby flowed into the nasal cavity. In discussing the probable action of the paraffin injection he notes that at the end of a few days the mucous membrane regains its normal color and its moist appearance, so that the injections instead of destroying the functions of the mucosa would appear, on the contrary, to stimulate its activity. His experience of this line of treatment in ozæna cases seems to be along the same promising lines as those indicated by Brindel.

Brockaert[2] has also experimented in a similar way, and reports two cases treated by himself. Instead of using plain paraffin he injected "*paraffine guaiaformee*," the paraffin being combined with a mixture of formic aldehyde and guaiacol. He considers the introduction of these two antiseptics as furnishing an additional advantage to the procedure. Guaiaform is insoluble in water, but is soluble in dilute alkaline solutions; it preserves its properties when heated up to 70° C., and it is not decomposed by the melting of the paraffin. In each case two cubic centimetres were used, the paraffin having a melting point of 50° C. Slight swelling of the eyelids and cheek on the same side as the operation followed, but this disappeared. Time and further research in this field will show whether any lasting benefit is to be derived from reconstituting the inferior turbinated bodies, or whether this line of treatment, like others, will be discarded as useless.

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[1] Revue hebd. de Laryng., May 31, 1902.

[2] Ibid., July 5, 1902.

THE ACCESSORY NASAL SINUSES.

Papers upon suppuration in the accessory sinuses continue to appear in the journals. The subject is always full of interest, but it is not our intention to do more than refer to a few of the papers and discussions which have been published during the last twelve months. With regard to the pathology and bacteriology of this affection, we must note the observations of Kirkland and Stacy, of Sydney, Australia.[1] These observers have repeated the work already done by E. Fränkel, Harke, and Wertheim in relation to the post-mortem appearances of the cranial sinuses, while Stacy has also investigated their bacteriology after death. Apparently this is the first time that work of this kind has been carried out in the Southern Hemisphere, and it, therefore, adds additional interest, inasmuch as climate may possibly influence the etiology of these conditions. The examinations, which cover a period of one year, were made upon one hundred subjects. During four months of this period an epidemic of influenza occurred, and a number of the cases proved fatal from pneumonia. In eleven out of twenty-two cases of pneumonia one or another of the sinuses were involved. In eight of them the sphenoidal sinuses contained pus, while in three a clear fluid was present; thus, in 50 per cent. of the cases dying of pneumonia, the sphenoidal sinus was affected. Of the whole number of cases dying of various diseases, no fewer than thirty-five were found to contain pus in one or the other of the cavities. If the twenty-two cases dying of pneumonia are deducted from these, there are only thirteen cases left in which suppuration was present, thus demonstrating the greater prevalence of the affection in pneumonia. Are we then justified in assuming that the pneumococcus plays an important part in the production of accessory sinus mischief? In addition to the thirty-five cases in which pus was found, it is stated that in twenty fluid other than pus was present, and this fluid is described as being clear. Now, this question of fluid in the sinuses after death, whether clear or purulent, and the great number of cases of the kind which various observers have reported, always raises in the mind of the reader a desire to find some explanation of the frequency of such post-mortem appearances. It is difficult to believe that so many individuals could have been the subjects of sinus suppuration for any length of time prior to the illness which eventually proved fatal. We are justified in the assumption that the cavities become involved shortly before death. The possible, or, indeed, the probable explanation of this occurrence is to be found in the action, or want of action, of the cilia covering the mucous lining of the sinuses. This has been well put by Lambert Lack, who is of the opinion that the cilia become enfeebled or may cease to act during the fatal illness. In this way the fluid actually secreted in the cavity becomes stagnant and accumulates. With the deficient action of the cilia the organisms find more ready access, and thus infection of the cavities may take place, and, after death, either a clear or a purulent fluid may be found according to the stage of the process.

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[1] Journal of Laryngology, London, November, 1902.

The different varieties of organisms found after death in the accessory sinuses are tabulated by Stacy. A difficulty is experienced in distinguishing the exact form of organisms present in many of these cases, as, for example, a pneumococcus from a staphylococcus which has assumed a diplococcal arrangement. A subdivision of the cases is made into those in which the fatal illness was of an infective nature and into those dying from non-infective causes. Of the former group there were about sixty-four, and of these thirty-four showed some affection of the sinuses, while the remaining thirty did not. In many of the thirty-four cases only a few of the sinuses were affected, and in some of these at least there was reason to believe that the condition was not due to the current disease, but to a previous one. Streptococci and staphylococci were the organisms found, and also diplococci resembling the pneumococcus.

Mosher has made some measurements relative to the distance between the nasal orifice and certain points within the cavity of the nose, with the view of assisting the operator in his surgical work.[1] A comparison of the measurements made on wet and dry preparations showed that one-eighth to one-fourth of an inch had to be added to any distance ascertained upon the dry skull in order to make it correspond to that obtained when the soft parts are in position. In order to establish certain external landmarks upon the face for the guidance of the operator, a number of measurements were made and the position of the cribriform plate ascertained. This was found to correspond to a horizontal line passing through the mid-point of the inner wall of the orbit in the dry skull, while in wet specimens the same horizontal line lay one-eighth of an inch above the inner canthus of the eye. The position of the ostium maxillare is indicated by a horizontal line drawn one-quarter of an inch above the lower margin of the orbital cavity.

The same author also investigates[2] upon the skull the anatomy of the parts involved in reaching the ethmoidal cells through the antrum, along the route adopted by Jansen in opening the sphenoidal sinus.

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[1] Annals of Surgery, October, 1902.

[2] American Journal of the Medical Sciences, November, 1902.

On the dead body this is an easy matter. The antrum is opened through the canine fossa and its inner or nasal wall is exposed. The following structures are found in its upper part: Anteriorly—that is to say, nearest the facial end of the wall—the first quarter of an inch represents the outer boundary of the lacrymal canal; immediately posterior to this lies the ostium maxillare; this may be situated as much as half an inch from the facial end of the wall. Beyond the ostium the nasal wall is almost entirely membranous, with the exception of the uncinate process of the ethmoid. Beyond this again is the maxillary process of the palate bone lying against the posterior inner angle of the antral cavity. There is no bloodvessel of any size in the nasal wall of the antrum. If a horizontal incision is commenced a quarter of an inch from the anterior end of the nasal wall and carried backward, the lacrymal canal is avoided and the other structures above enumerated are divided without difficulty. If a curette is passed through the incision at the situation of the ostium maxillare and carried backward with an inclination upward, it will strike the ethmoidal bulla and then the posterior ethmoidal cells, and finally reach the anterior wall of the sphenoidal sinus. The ethmoid labyrinth is opened along its lower outer angle. The height of the working space is about half an inch, and is somewhat less than the vertical diameter of the os planum.

The Ultimate Results of Surgical Operations upon the Frontal and Maxillary Sinuses. We cannot but feel that the time has now arrived when the publication of the ultimate results of the numerous operations performed upon the accessory sinuses would make a welcome addition to the literature of the subject. So many operations are now performed all over the world, and as several years have elapsed since such operations were more generally undertaken, it would be a matter of the greatest interest to all to learn what percentage of cures have really followed radical interference, how many deaths have followed radical interference, and in how many instances more than one operation was found necessary to effect a cure. If such a collective investigation could bring out a really accurate statement upon these points it would undoubtedly be of considerable value to the surgeon. One cannot but feel somewhat doubtful, however, as to the possibility of thus obtaining complete and accurate information regarding this aspect of the subject.

At the annual meeting of the British Medical Association, 1902, an attempt was made to raise a discussion on this very subject along the lines indicated by the heading of this section. A perusal of the report of the meeting[1] shows, however, that the discussion turned largely upon the methods of operating and not upon the ultimate results, and for that reason we must confess to some disappointment in reading it. Lermoyez, who introduced the discussion, undoubtedly furnishes some statistics, but we would like to have seen more detail in regard to them. There are several points of interest in Lermoyez's paper, which is based upon the cases observed by himself and his assistants. There are 112 in all, and are made up as follows: Suppuration in the maxillary antrum only, 76; in the frontal sinus, 4; in the frontal and maxillary sinuses together, 30, and in the frontal and ethmoidal cells, 2. In discussing operative interference upon the frontal sinus, in the first place he refers to the operation commonly known as the Ogston-Luc method, and points out that while it has certain advantages it also has its inconveniences. The advantages are that it avoids disfigurement, it insures the immediate closure of the wound, and it opens up the anterior ethmoidal cells. Its disadvantages are that it is very liable to relapses, due to inefficient curetting and to the fact that the whole sinus is not efficiently explored through the small opening; that it renders the patient liable to suppuration of the scalp, and that cerebral complications may ensue. Statistics are furnished with regard to this. Of 36 cases of frontal sinus suppuration, 17 were operated upon by Luc's method; of these, 9 healed by first intention, the remaining 8 relapsed. Of this last group, 5 were subsequently cured by Kuhnt's method; 1 by a repetition of the Luc operation, while 2 died—1 of meningitis and 1 of slow septicæmia.

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[1] British Medical Journal, August 30, 1902; Annales des Malad. de l'Oreille, etc., November, 1902.

Lermoyez advocates most strongly an operation which combines the best points in both the Ogston-Luc and Kuhnt operations—that is to say, an operation which aims at the obliteration of the sinus and at the same time permits of free drainage into the nose, with removal of the diseased anterior ethmoidal cells. Briefly, it may be stated that the whole anterior wall of the cavity is removed with as much of the floor as may be necessary to effect obliteration. In this way the whole cavity can be thoroughly explored, and all the recesses dealt with by careful curetting. The anterior ethmoidal cells are destroyed, so that there is a free opening toward the nose, and the risks of reinfection from suppurating ethmoidal cells prevented. The scalp flap is then allowed to fall against the posterior wall of the sinus, and in this way obliteration takes place. There are two inconveniences which must be taken into consideration: one, the disfigurement, which is greater; the other, the possibility of causing diplopia from interference with the pulley of the superior oblique muscle. It is really more correct to say that these inconveniences are dependent upon the depth of the sinus rather than upon its superficial extent. If the sinus is a shallow one, there is little or no floor to remove, and the trochlea of the superior oblique is not displaced, and for the same reason the shallower the sinus the less the sinking in of the skin flap. Disfigurement, if it is a source of annoyance to the patient, may be remedied by subcutaneous paraffin injections, and if diplopia should persist a complementary operation upon the inferior rectus muscle may be performed.

The statistics of the Kuhnt-Luc operation as furnished by Lermoyez are good. In 11 cases operated upon by him in this way 11 cures resulted. Further, in 6 cases previously operated upon unsuccessfully by the Luc method, good results were obtained.

Before leaving the subject of the radical operation upon the frontal sinus, I wish to draw the reader's attention to the operation carried out by Killian. This has recently been dealt with both by Killian himself and by Krauss.[1] In order to preserve the contour of the forehead in this situation the supraorbital bony margin is not removed, but is left as a bridge, after the anterior and inferior walls of the sinus have been taken away. The skin incision is carried from the temporal or outer end of the supraorbital margin inward along it, and when the inner end of the bony edge is reached the incision turns downward and outward, being carried as low as the inferior extremity of the nasal bone. In making this incision the knife is only carried down as far as the periosteum. The periosteum is next divided along two lines which correspond in length to the skin incision, one being situated from 5 to 6 mm. above the free edge of the orbital margin, the other lying 5 to 6 mm. below the previous incision. The periosteum is then raised upward from the anterior wall of the sinus, and through the lower incision is stripped from the floor of the sinus. The intervening portion remains upon the ledge of bone which is to form the bridge. The anterior wall of the sinus is removed, as is also the floor, and, along with the latter, the nasal process of the superior maxilla. While working in this region one must take great care to preserve the tear sac, the pulley of the superior oblique muscle, and the nasal mucous membrane. Recesses of the frontal sinus, the extensions of the ethmoidal cells into the roof of the orbit must be dealt with, while the anterior ethmoidal cells and the corresponding part of the middle turbinal are also removed through the lower part of the incision and floor of the frontal sinus. Where it is necessary the posterior ethmoidal cells and the sphenoidal sinus may be attacked through the same route. An important step in the operation, according to Killian, is the formation of a flap from the nasal mucosa, which is left in order to preserve a patent channel toward the frontal sinus. After the cavity has been curetted and cleaned a perforated rubber drainage tube is inserted, which extends from the external or temporal angle of the wound through the floor of the sinus down to the entrance to the nose, and along with this a gauze packing is introduced which also is passed down into the nose. The skin wound is carefully stitched. The bandage and superficial dressing are changed every day, the gauze packing is removed on the second day, the drainage tube on the fourth, and the stitches on the fifth. The cavity is not syringed out from the nose.

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[1] Archiv f. Laryngol., Berlin, 1902, Bd. xiii. Heft 1.

We must again turn to Lermoyez's paper in order to refer to some of his observations upon the antrum of Highmore. This author is of the opinion that antral suppuration is more frequently of dental than of nasal origin, and points out that the infective teeth belong to three clinical types: those in which the teeth are carious on the surface, those in which they are stopped, but are incompletely disinfected, and those in which the teeth are dead and the surface unbroken. He holds the view that the antral cavity is at first only the receptacle for pus that has broken into it from a dental abscess, and it is only later that the antrum itself commences to secrete a purulent fluid. From the point of view of treatment it is, therefore, important to conclude whether we are dealing with a true suppuration of the lining membrane of the sinus or only with a cavity containing pus which it has not itself formed. Whether the suppuration in the antrum be of nasal or of dental origin, he is more in favor of treatment through the nose than through the mouth, where the method of lavage is adopted. In those cases of dental origin the teeth and gums must be carefully attended to, but no communication must be made between the sockets and the sinus cavity. On the contrary, having drawn the teeth, the antrum should be punctured and washed out through the outer wall of the inferior meatus of the nose. In many cases he finds that it yields excellent results, and, as a rule, from three to twelve syringings are necessary to obtain this result. Of 30 chronic suppurating sinuses, 13 were radically cured by this method. It did not seem to matter for how long the period was during which the sinus had been discharging. In two cases he cured a condition of one year's standing by one washing. One finds it difficult to believe that an antrum into which pus has discharged from a dental abscess can remain merely a receptacle for any length of time without becoming actually a pus-secreting cavity. Notwithstanding that Lermoyez has obtained a similar percentage of cures by lavage through a buccal opening, he still considers the nasal route the better one.

His reasons are these: 1. With the buccal opening the cure is very slow, demanding not merely weeks, but even one or two years. 2. The cure is uncertain. 3. The patient who is not cured is an invalid condemned to wear a tube always. 4. The infection of the frontal sinus is a danger in consequence of the syringing occasionally driving pus to the higher cavity.

In discussing the radical operation upon the maxillary sinus, he prefers the Caldwell-Luc method of making a counter-opening into the nose. There seems to be a more or less general tendency now to adopt this procedure, and, notwithstanding the fact that I have previously obtained good results by carrying on after-treatment through the buccal wound in the canine fossa, I now prefer to stitch it at once and carry out the after-treatment through the nasal opening in the inferior meatus. Lermoyez's statistics show that out of 46 cases treated in this way 40 cures were obtained. The average time required to effect a cure was five weeks, while in some only a fortnight was necessary.

Treatment of Ethmoidal Cell Suppuration. Lambert Lack[1] again reports upon his method of radical operation upon the ethmoidal cells. The general anæsthetic which is necessary should be light, so as not to abolish the reflexes completely. The postnasal spaces should be plugged when the posterior ethmoidal cells are not affected. For scraping ring knives should be used in preference to sharp spoons, as more material can be removed by them, and less force is necessary. The cutting edge should be directed outward and fairly firm pressure exerted in this direction without danger. Should the bone forming the wall of the orbit be perforated, no ill-effect will follow. No force at all should be used in scraping upward for fear of injuring the cribriform plate. If a ring knife be large and sharp the risks are diminished. The operation must be continued until every piece of soft bone and degenerated mucous membrane has been removed. On introducing the finger into the nose at the end of the operation, it will usually be found that the antrum has been freely opened into from the middle meatus, so as to admit the passage of one or two fingers. After these operations, therefore, it is advisable to puncture the antrum and wash it out. The best after-treatment consists in doing as little as possible. The nose should not be packed unless this is required for hemorrhage, and then it is better to remove the packing on the following day and not to replace it. After the first twenty-four or forty-eight hours the nose should be very gently irrigated. Granulations, often extensive and œdematous, may appear in the upper part of the nose for the first week or two. These are best left alone. In the majority of cases a cure is obtained, though this is not invariable, as the entire disease may not be removed. A slight rise of temperature after the operation is probably due to septic absorption from the raw surface. In one or two cases a temperature of 103° and 104° F. has been recorded. Suppurative otitis media has occurred in a small number of cases. Lack considers that the operation of removing the diseased ethmoidal cells at one sitting under a general anæsthetic is efficient, and at the present time nothing has been recommended which could replace it.

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[1] Journal of Laryngology, London, November, 1902.

At the meetings of the British Medical Association and of the American Laryngological Society the subject of accessory sinus suppuration was discussed at some length, and we would refer the reader to the reports of these meetings for further details regarding it.

GENERAL ANÆSTHETICS IN MINOR OPERATIONS UPON THE THROAT AND NOSE.

Although I am conscious that there is nothing really new to be said about the employment of general anæsthetics other than chloroform in this department of surgery, it seems to me that it will not be out of place to review some of the recent papers dealing with the subject and quote the experience of those who have used them. While it is true that attention has been turned to the administration of bromide and chloride of ethyl and nitrous oxide gas—the two principal drugs in this connection—on account of the saving of time that undoubtedly accompanies their use, it is mainly, however, due to the fact that fatal accidents from time to time follow the employment of chloroform. It is most unfortunate that such fatalities should occur because, in spite of certain advantages which bromide and chloride of ethyl undoubtedly offer, still think that chloroform holds the first place in all operations in this region, whether they require a short or a long time for their execution. I am quite aware that this statement is open to criticism; but, although conversant with the advantages of the other anæsthetics, I am still of the opinion that the advantages of chloroform outweigh the other drugs employed for similar purposes.

A long and valuable paper on the administration of *bromide of ethyl* has recently appeared from the pen of Brown Kelly,[1] of Glasgow.

The whole subject is discussed chemically, historically, and clinically, and he submits a large experience of its use. The chief characteristic of this drug is, of course, its very rapid and transient action. In about one minute it produces unconsciousness which lasts upon an average one to two minutes, and when the patient awakens he regains almost at once his normal state. It gives a longer anæsthesia than nitrous oxide gas, and it possesses the additional advantage of not requiring any special apparatus for its administration. With regard to this last point Kelly states that he employs a piece of folded lint applied so as to cover the patient's nose and mouth. Special care must be taken to prevent the entrance of air at the sides of the compress, otherwise anæsthesia will be delayed or not obtainable. On the other hand, there need not be any attempt to asphyxiate the patient, so that no impermeable mask is required; the lint, indeed, may be raised in the form of a cone over the nostrils and lips. Attention is drawn to this point, because it is sometimes stated that an impermeable material should be employed. He uses the following scale of dosage: To children under three years of age, 1 drachm; to those between three and twelve years 2 to 2½ drachms, and to young adults, 2½ to 3 drachms. It is better to administer the full dose at the outset than to add an additional quantity later in the administration. The sitting posture is adopted by Kelly, and both the tonsils and the adenoids are removed at the one operation. It is true that the duration of the anæsthesia varies in different subjects, but, as a rule, one to two minutes of insensibility may be obtained in most cases under the age of fourteen years. My own experience has been that if the tonsils are such that they can be removed with the guillotine then there is sufficient time given for their removal along with the adenoids. If, however, the bistoury and the vulsellum are required as in the flat form of tonsil, then there is some difficulty in completing the whole operation within the time of complete anæsthesia. The difficulty thus encountered is due rather to the struggles of the patient than to the fact that he has actually become conscious of suffering pain. One of the disadvantages of bromide anæsthesia lies in the fact that the jaw muscles may not relax, even though the patient is otherwise completely under its influence.

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[1] British Medical Journal, August 30, 1902.

The difficulty in inserting the gag is then very considerable, and valuable time may be lost before this is successfully accomplished. In order to obviate such risks the gag should be placed *in situ* before the anæsthetic is commenced, but in some children even this is no easy matter, if, as is often the case, they have become frightened. Relaxation of the limb muscles and regular stertorous breathing are the best indications that narcosis is sufficiently deep. The rapid recovery from the anæsthesia does not appear to me to be always an unmixed blessing, as the struggles of the child are often very disconcerting to the attendant and the cause of very considerable trouble. Kelly's experience is based upon the administration of bromide of ethyl in 1200 cases, chiefly for the removal of adenoids and tonsils. While no fatalities occurred in his practice, he narrates three cases in which some alarm was felt for a brief period on account of the condition of the child. In one case both the pulse and respiration apparently ceased for twenty seconds. In a second case the patient remained collapsed for three or four minutes with only an occasional respiration, while in the third artificial respiration was found necessary.

Death following the administration of ethyl bromide is not unknown, even when the pure drug has been used with care. Kelly notes four cases which have been recorded, and it is interesting to observe that all of them were adults. In all of them there would appear to have been some abnormal condition present, so that possibly a similar result would have followed any other anæsthetic. So far as he could ascertain, only one death has followed the use of bromide of ethyl when given for the removal of tonsils and adenoids. In summing up the advantages of bromide the author claims for it that no special apparatus is needed; narcosis is rapidly produced; the vapor does not irritate the respiratory passages; the upright position of the patient is permissible; there is a quick return to consciousness; the after-effects are unimportant or *nil;* the danger is insignificant; the operator can himself superintend the progress of the narcosis, and, finally, the amount of time saved is very considerable, it being possible to operate upon eight or nine patients in one hour.

Gibb Wishart,[1] of Toronto, records his experience with ethyl bromide, having abandoned nitrous oxide gas in favor of it. He objects to the laughing gas mainly for two reasons: first, from the position which the patient is forced to adopt, that is, as nearly prone as possible, and, second, from the asphyxiated appearance which is produced and the embarrassed respiration; further, the apparatus that is necessary is against its employment. In the administration of ethyl bromide the normal color of the face is retained, respiration not interfered with, and the apparatus can be carried in the pocket. Like Kelly, he adopts the sitting posture for his patient. Personally, I have never had any difficulty in placing the head over the end of the table, just as I am in the habit of doing with chloroform anæsthesia. It has been stated that there is often trouble in getting the head to hang in a dependent position over the end of the table on account of the rigidity of the muscles of the back of the neck, but I have never met with any trouble of this kind. Gleitsmann, of New York,[2] also contributes a paper on this subject. He has commenced the use of ethyl bromide in adenoid operations, having substituted it for the A. C. E. mixture formerly employed.

Chloride of Ethyl. It is interesting to hear that ethyl chloride, used for so long a time as a local anæsthetic, is now coming into more frequent use for obtaining general anæsthesia. Louis Vacher, of Orleans,[3] gives a short retrospect of the history of its introduction for this purpose. Apparently a dentist by the name of Carlson first realized, in 1895, that it was capable of producing a general anæsthesia, and in the following year the first experiments with it were made on the human subject by Thiesing. Since 1900 it has come into general use in surgery, and a number of surgeons have employed it with success, and it is especially useful in inducing anæsthesia before chloroform is administered. Vacher's experience has been very satisfactory. The drug is administered on a handkerchief rolled up as a cone, upon which a piece of paper is pinned as a cap. This renders the apparatus more impermeable. A few cubic centimetres of ethyl chloride are then poured upon the mask, which is accurately applied over the patient's nose and mouth. He is directed to breathe freely through the mouth. In from fifteen to thirty-five seconds anæsthesia is complete if the respiration has been good. If now the administration is stopped the duration of the anæsthesia will only be for about one minute, and the patient rapidly regains consciousness. If one continues, a period of "contracture" supervenes, which varies in different individuals, and which is often absent. At the same time there is contraction of the pupils and loss of corneal reflex. A few seconds later muscular flaccidity is complete, the patent snores, and anæsthesia is deep. There is dilatation of the pupils, but no cyanosis, and there is no contraction of the jaw muscles, as is so often seen with bromide of ethyl. This anæsthesia, which is obtained at the most in thirty or forty seconds, lasts from two to four or five minutes. By readministering the drug a second or even a third time a complete anæsthesia lasting from ten to fifteen minutes can be procured. Recovery is always very rapid. It does not produce nausea or headache, and vomiting is rare. Administered in this way it is very serviceable in operations upon the nose and pharynx, while it can be used for paracentesis of the tympanic membrane, removal of the ossicles, curetting the tympanum, and opening furuncles.

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[1] Dominion Medical Monthly, July, 1902.

[2] Transactions of the American Laryngological Association, 1901.

[3] Annales des Malad. des l'Oreille, etc., June, 1902.

Hatch[1] prefers the chloride of ethyl to nitrous oxide in operating upon the teeth, as it does not produce the unpleasant choking sensation, and there is an absence of cyanosis. The duration of the anæsthesia is longer, and the patient comes under its influence more readily. His experience is based upon 1000 cases, which were all devoid of accident. Martin Ware,[2] who had used this anæsthetic on 200 patients, records that in 11,207 published cases one death had occurred.

Therapeutic Agents in Nose and Throat Affections. *Anæsthesin*[3] possesses the important quality of producing a local anæsthesia when used as an inhalation. For this reason its therapeutic value can be appreciated. Kassel[1] has employed it in nose and throat conditions. We are all aware of the value of orthoform in painful ulcerations of the larynx, applied in the form of insufflations, but the remedy now under notice has an additional point in its favor, in that the patient can make use of it himself. The vapor apparently is non-poisonous, and is used by means of the ordinary steam inhaler. The tongue should be pulled out of the mouth as far as possible, while the tube of the inhaler is placed far back. An oily solution is employed, containing the following ingredients: anæsthesin, 20 parts; menthol, 10 to 20 parts; olive oil, 100 parts. Should the menthol prove irritating to the eyes and nose, it may be left out. The anæsthesia thus produced may last from two hours to a whole day, consequently, in dysphagia from tuberculous ulcers a long period of relief may be obtained. It will be interesting to see whether further trial will bear out Kassel's experience.

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[1] Journal of the British Dental Association, September, 1902.

[2] New York Medical Record, April 6, 1901.

[3] See PROGRESSIVE MEDICINE, December, 1902, p. 327.

Ichthargan. Ichthargan is a compound of two drugs, each of which by itself is a useful remedy in nose and throat affections, namely, ichthyol and silver. A series of experiments have been made with ichthargan by Aufrecht,[2] while its clinical application in this department has been observed by Beaman Douglas,[3] from whose paper I am now quoting. This silver compound is a brown amorphous powder, odorless, soluble in water, glycerin, and dilute alcohol, but insoluble in absolute alcohol, ether, and chloroform. Ichthargan contains 30 per cent. of silver and 15 per cent. of sulphur. It thus contains considerably more silver than is found in protargol. In order to ascertain the various properties of this compound, experiments were made by Aufrecht. This worker found that when a series of experiments were made with silver nitrate and ichthargan the latter possessed a higher bactericidal power over anthrax bacilli, streptococci, staphylococci, and diphtheria bacilli. It was also found to be less toxic to frogs, guinea-pigs, rabbits, and dogs. He concluded that when administered by the mouth or subcutaneously it is not followed by dangerous results.

In throat and nose work ichthargan may be used in strengths varying from 1 : 10 to 1 : 50, but Douglas has found 1 : 20 serviceable for general use. Water or glycerin, or a mixture of the two, makes a convenient vehicle for the drug. Both solutions were experimented with in order that the action of the glycerin might be extended. Ichthargan should not be employed as a powder, because considerable irritation is produced when used in this form. After experimenting with solutions of various strengths he found that a 4 per cent. solution appeared to be the most satisfactory. The following points could be noted when used in the nose: Its anæsthetic effect is not marked, and is apparently only secondary to the anæmia produced by the contraction of the bloodvessels. Its antiseptic effect is not limited to the culture tube, but is observed in cases of atrophic rhinitis, where the odor becomes lessened by its use. As an antiphlogistic, its first action is to produce an anæmia of the mucous membrane, followed by a return of the mucosa to its normal condition, unless stronger solutions are used, when a temporary congestion is produced. After being used for some time tolerance to the drug is established, and this is followed by improved vascular tone and a disappearance of congestion. This antiphlogistic action has been observed both in acute and chronic conditions. The drug also acts as a stimulant, first, as an alterant producing a more healthy circulation, diminishing congestion, and lessening exudation. Further, it modifies the secretion, rendering a mucopurulent secretion first mucoid and then normal. The alterative effects and the action on the secretion appear to be due more to the ichthyol than to the silver, and, even granting that we owe more to the ichthyol than to the silver, it must not be forgotten that in the compound we have an odorless preparation and one in which the taste of the ichthyol is modified by the metallic taste of the silver.

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[1] Therapeutische Monats., July, 1902.

[2] Deutsche med. Wochenschrift, 1900, No. 13.

[3] The Laryngoscope, May, 1902.

It will be found most useful in acute catarrhal rhinitis in a 4 per cent. solution in cases of hypertrophic rhinitis and where obstruction results from disturbed circulation. In atrophic rhinitis it was used as an irrigation in weak solutions of 1 : 5000, and afterward in a 4 to 10 per cent. solution in water or glycerin, and in this condition it appeared to be a most excellent remedy. In acute catarrhal laryngitis in 4 to 8 per cent. solutions as a spray, and in laryngitis sicca as a 10 per cent. glycerin solution it can be recommended. In cases of granulation tissue forming after operation a 4 to 10 or 20 per cent. glycerin solution has been of very great value in healing the exuberant granulations and modifying the secretion. On the whole, Douglas concludes that ichthargan is very satisfactory.

THE LIGHT TREATMENT AND X-RAYS.

If we are to judge from the somewhat scanty literature dealing with the application of light, high frequency currents and X-rays to diseases of the nose and throat, we must assume that thus far therapy along these lines is not widespread. A difficulty, of course, exists from the nature of the apparatus required; it is not open to all to test the value of these methods. There can be no doubt, however, that there are advantages to be gained from these agents. In laryngeal affections the difficulty is to get the forces applied sufficiently near the diseased surfaces, and hence this region remains yet somewhat outside the domain of this line of treatment. Schiff states that the mucous membrane of the lips and nose reacts promptly to the Röntgen rays, and states that very favorable results have been recorded even when the mucosa has become ulcerated. Macintyre,[1] of Glasgow, in a recent paper again discusses at some length the different forms of apparatus necessary for carrying on this line of work, and also discusses the relative value of the light treatment, high frequency, and high potential currents and the X-rays. He concludes by referring to a number of clinical cases, and among them certain nose and throat conditions are quoted.

In dealing with lupus he employs the X-rays more frequently than the Finsen light, and in many cases of lupus of the mucous membrane the results are very gratifying. In one patient who had suffered from lupus of the nose, throat, and face for eight years, and in whom the disease passed into the pharynx and larynx, six months' treatment produced healthy changes. The treatment was a combination of X-rays and light. In another case of lupus of the mouth, lips, face, and neck six months' treatment brought about complete healing. As regards malignant disease, he records the case of a woman whose condition a number of observers considered to be malignant. Both nostrils were blocked with an ulcerating mass, which projected from them and which extended behind the lip and in front of the incisor teeth. The sense of smell was entirely lost. The static machine and the X-rays were applied with few interruptions for six months, and slowly but gradually the mass disappeared, the respiration through the nose was established, and the sense of smell regained. Apart from obtaining any curative result in certain cases, Macintyre has found that pain is relieved, ulcerating surfaces have become healthy, and that the offensive odor disappears.

FOREIGN BODIES IN THE ŒSOPHAGUS AND UPPER AIR PASSAGES.

Considerable progress has been made during the last few years both in the diagnosis and in the treatment of foreign bodies in the œsophagus and in the respiratory passages, mainly, however, in the direction of the former. This improvement is largely due to the application of the Röntgen rays for the detection of foreign bodies, and to the introduction of apparatus which will permit the surgeon to determine by direct inspection the site and the form of the body in question. In this connection I refer to the methods known as œsophagoscopy and bronchoscopy. Lastly, by the use of the electro-magnet, additional means may be at hand to enable us to withdraw from these passages metallic bodies having magnetic properties. It is to a brief study of these methods that I would now draw the attention of the reader.

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[1] Glasgow Medical Journal, November, 1902.

In view of the importance of this subject, a discussion was held upon it in the Section of Laryngology at the annual meeting of the British Medical Association, which met in Manchester, in July, 1902.[1] An account of the application of the X-rays to this department of surgery was considered by Dr. John Macintyre, who dealt not only with this but also with the use of the electro-magnet, to which we will refer later. In his opinion skiagraphy is of very great value in the detection of foreign bodies, and he is inclined to doubt whether their value has been fully appreciated. It is true that here as in other branches of surgery the method has its limitations. The foreign body may not be one which can be detected by the rays, and there are situations in which the anatomical relations of the parts prevent accurate localization by means of the rays. Nevertheless, there are occasions when nothing else will reveal the presence of the body, and, again, in combination with other means, it may render valuable assistance in diagnosis. Macintyre points out that very small bodies, whether lying in deep cavities or buried in the tissues, may be detected by the rays when other means of diagnosis prove useless. It is necessary, however, that the observer should be thoroughly conversant with the normal appearance of the parts seen on the screen or on the negative as well as with possible pathological conditions. He must further recognize the various shades of density that bone, cartilage, or muscle may produce when the rays are directed upon the tissue. The apparatus used should be of the very best, so that the best possible results may be obtained by it, and the surgeon should frequently train his powers of observation in normal conditions.

While it is undoubtedly true that very useful information may be thus obtained, one must not forget that his method may fail where one might least expect it to do so. The following case, recorded by Wild, of Zurich, is a good example of this: A man was admitted to the hospital with a history of having swallowed his tooth-plate. The X-rays were applied, but neither upon the screen nor on a photographic plate was any abnormal shadow detected.

The plate was of large size, measuring 5 x 2 cm., yet notwithstanding this the rays failed to show its presence. It was, however, revealed by bronchoscopy, lying in the left main bronchus.

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[1] British Medical Journal, London, August 30, 1902.

Bronchoscopy and Tracheoscopy. The same principle which lies at the foundation of œsophagoscopy has found more recent application in the examination of the trachea and bronchi. Direct examination of the trachea may be made by drawing the epiglottis forward by pressure on the tongue with one of the spatulas introduced by Kirstein. The reflex produced by such an examination, however, is very considerable, and the cases are, indeed, exceptional in which more than only a partial view of the larynx can be obtained. Killian prefers the tracheal tube introduced from the mouth through the rima glottidis. Having had as yet no personal experience of this method of examination, and having met with but small success in the use of Kirstein's autoscopy, one naturally is inclined to wonder what proportion of the examinations attempted upon the lower air passages are really attended with success. No feeling of doubt, however, should deter us from trying to make ourselves efficient in what certainly appears to be a valuable aid in the diagnosis and treatment of foreign bodies. In performing direct upper tracheoscopy, Killian passes the tube under the guidance of the eye, looking continuously through it, and thus watching its progress from the time it is introduced into the mouth until the end reaches the trachea. Foreign bodies are thus discovered and extracted by means of special forceps. Sometimes a freely movable body is blown against the lower end of the tube, thus obstructing it and tending to produce a suffocative attack. By pressing the body down breathing may again be restored. In cases where tracheotomy has been found necessary and where the foreign body has not been coughed up, lower direct tracheoscopy may be carried out—*i. e.*, the introduction of the tube through the tracheotomy wound.

If the body has been sucked into the bronchi just beyond the bifurcation of the trachea, the tracheoscopy tubes suffice both for diagnosis and extraction. If, however, the body lies deep down longer tubes are introduced into the bronchi. Killian states that the bronchial tubes, which are highly elastic and embedded in soft tissue, may be pressed by the metallic tube without fear into the median plane, so that the trachea, the larger bronchus and its branch are brought into one straight line. Bronchoscopy allows the whole bronchial tree to be searched, and even the left principal bronchus, which branches off at a sharper angle laterally than the right, can be gently pressed and brought into as clear a view as the right one. During the examination the field must be kept clear by mopping the secretion, the sponges being fixed upon long handles; by the use of a small suction pump the same end may be attained. The difficulty which is apt to arise is that the foreign body may be sucked into the lower open end of the bronchoscopy tube, with the result that very considerable respiratory difficulty may arise. In order to diminish the discomfort and inconvenience thus produced the tube should be provided with an opening some little distance from its lower end.

Up to the time of the publication of Killian's paper bronchoscopy had been employed in twenty cases. Of these eleven had occurred in his own practice. Nearly one-half of all the patients were children; six of these were between the ages of two to six years, while four were between eight and twelve years. The foreign bodies were of the most varied character. In one-half of the cases they had been inspired a few days before coming under treatment; in the other half the bodies had remained in the lung for months or years. In nine out of eleven cases in which *upper* bronchoscopy was employed a correct diagnosis was made. It failed in the other two; in one, because the foreign body consisted of fine downy feathers too small to be seen; in the other, a large pin with a glass head, which had been inspired some years previously, had become embedded in what was probably fibrous tissue. In nine cases in which *lower* bronchoscopy was employed the diagnosis was established. In two cases it was proved with certainty that the suspicion of a foreign body in the lung was unfounded.

Extraction was attempted in fifteen cases, and succeeded eight times with upper, five times with lower bronchoscopy. In two cases, one recorded by Thost, the other by Spiess, removal was unsuccessful; in one, because suitable instruments were not at hand; in the other, owing to the fact that the foreign body lay in an abscess cavity with a narrow opening. Both these patients died. Of the patients of whom extraction was successful, one died nine months after the operation from purulent pleurisy. The foreign body had lain for five months in the left principal bronchus, and considerable stenosis existed at the site.

It will not be out of place to note here certain points in the technique of the operation. It must be evident to all that considerable skill is required in the manipulation and that experience is required for carrying out the procedure with success. Good illumination is essential, and for this purpose the electric light attached to a foreign band and condensed by a lens serves the purpose of illuminating the tubes. The latter are fixed to a handle similar to that employed in Kirstein's direct laryngoscopy. The patient may be given a general anæsthetic or the local application of cocaine may be quite sufficient. For this purpose the pharynx and larynx are twice painted over with a 20 per cent. aqueous solution or a 25 per cent. alcoholic solution of cocaine. Excitable patients are given a hypodermic injection of morphine twenty minutes before the examination is commenced. Under cocaine the tube may be passed with the patient in the sitting posture. With the upper part of the trunk thrown forward, the shoulders braced back, and the head thrown backward, the tube is passed through the mouth under good illumination. In carrying out upper direct tracheoscopy in adults, tubes varying from 15 to 20 cm. in length and 9 to 11 mm. in width are used. In children, on the other hand, the tubes vary from 10 to 15 cm. in length and 5 to 7 mm. in width. Under the guidance of the eye, first the epiglottis and then the interarytenoid region is brought into view, and, finally, the posterior ends of the vocal cords. If a general anæsthetic be employed, as in children, the patient is placed in a horizontal position, with the head hanging over the end of the table. When the lower direct tracheoscopy is carried out—that is, through a tracheotomy wound—cocainization of the trachea suffices. In this instance wider tubes may be employed—14 mm. wide and 5 to 15 cm. in length. The whole of the trachea, the bifurcation, and the entrance to the main bronchi become clearly visible. If lower direct bronchoscopy is desired, the bronchi are painted with a 10 to 20 per cent. cocaine, but in the case of the left bronchus this cannot be done until the tube is passed down to its entrance. The tube is passed 4 to 5 cm. along the main bronchi, and in this way the latter are straightened. Even bronchi of the second and third degree may be penetrated, and Killian has observed the branching of the main bronchus in the upper lobe of the lung. When upper direct bronchoscopy is attempted, thorough cocainization may suffice in some adult patients, but in others and in children a general anæsthetic in addition must be administered. The length of the tubes is estimated by measuring from the upper incisors to the middle of the sternum, a distance measuring, as a rule, from 30 to 35 cm. in the adult and from 15 to 25 cm. in infants. The tube, warmed and oiled, is passed in the mesial plane, and must enter the chink of the glottis during inspiration.

The Use of the Electro-magnet. Our review of this subject would not be complete did we fail to draw attention to the possibility of extracting certain foreign bodies by means of magnetic attraction. Macintyre, in the discussion at Manchester, from which we have already quoted, draws attention to this method. He has already satisfied himself that in the nose and nasopharynx it proves to be a useful means for the extraction of metallic bodies. Its application to the trachea and bronchi cannot be doubted in those cases in which tracheotomy has been performed, as shown in an interesting case reported by Garel,[1] of Lyons. This writer records the history of a child, aged eighteen months, who swallowed a long nail which had entered the right bronchus. It was not until two months after the accident that the child came under Garel's observation. Suspecting the presence of a foreign body, he applied the X-rays and located the nail in the right bronchus about the level of the sixth intercostal space. Tracheotomy was performed, and the point of an electro-magnet was brought to the tracheal opening, and the nail was at once dislodged from the tissue in which it was fixed and flew to the magnet. The body, which measured fifty-three millimetres in length, must have been situated no less than six centimetres from the tracheal wound. Macintyre has constructed an instrument for use under similar circumstances. He points out that in spite of the great power which such an instrument may possess its influence diminishes greatly when it is applied to a small surface of metal. So, also, the further away the body is from the magnet the less is its power of attraction. He also draws attention to the possibility of passing it over the surface of the chest, with a view to dislodging the foreign body and bringing it up to the region of the larynx. By retaining it there and by introducing another magnet into the pharynx he suggests that it might be possible to remove in this way a metallic body through the mouth. This subject remains as yet, however, a matter for speculation.

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[1] Annales des Malad. de l'Oreille, etc., February, 1901.

The question of removing certain magnetic metallic bodies in this way was first suggested by Roaldes, of New Orleans, and this writer again returns to the subject in a paper read before the American Laryngological Association in 1901. For the purpose of testing the practical utility of such a method he made a number of experiments upon the cadaver, introducing various foreign bodies into the trachea, bronchial passages, and attempting to extract them by means of Haab's giant electro-magnet. The foreign bodies were placed in different situations in the nose and nasopharynx, and all but two were extracted successfully by the aid of the magnet placed in front of the nares. The cases likely to fail in this situation are those in which the foreign bodies are pointed and sharp, and may in consequence become fixed in the tissues of these irregular cavities. Bodies placed in the larynx, whether above or below the vocal cords, resisted the attraction, although the magnet was placed in the mouth about an inch and a half from the teeth. When the bodies were placed in the trachea and bronchi and a low tracheotomy performed they were easily removed by the magnet placed on a level with wound, and in one case when it was held three-quarters of an inch from it. Failure ensued when the nail or button lay deeper than five inches from the tracheal incision—that is to say, in these cases, two inches below the bifurcation. In still another series of experiments the bodies were placed in the bronchi and the magnet was laid externally against the thorax immediately over the situation of the body. The magnet was carried up to the tracheotomy wound, attracting the body with it, the latter passing up the anterior wall of the trachea and emerging from the wound. An attempt to propel a button from the trachea through the larynx into the mouth proved a failure. A difficulty, therefore, appears to exist at the glottis, but in addition to that the angle between the mouth and the lower pharynx appears to provide yet another obstacle. The less the distance between the object and the magnet and the more direct the line between the two the more easily is the extraction carried out. It is possible that by the employment of two magnets greater success may be yet obtained. The body may be drawn as far as the larynx by one of them, while the second is inserted into the mouth and further extraction effected by means of it. A combination of the magnet and upper direct bronchoscopy may yet form the ideal method of treatment in a class of metallic foreign bodies. The whole of this subject of extraction of bodies from the air passages is full of interest, and time will show what further developments may yet take place in connection with it.

OTOLOGY.

BY ROBERT L. RANDOLPH, M.D.

EXTERNAL EAR.

Aural Bougies. Dr. George L. Richards[1] several years ago called attention to the value of aural bougies in relieving earache and otitis externa, and he has recently alluded to this subject again. The bougies are composed of atropine, cocaine, carbolic acid, and gelatin-glycerin. They are moulded into the proper shape, and should be about half an inch long and the size of a quill. In his experience earache had been aborted in considerably over half of the cases occurring in children.

Nitrate of Silver in Otitis Externa. In the text-book references to otitis externa I have often been struck with the apparent insignificance attached to this disease. I am not referring now to that variety of inflammation which is characterized by marked swelling of the cartilaginous portion of the canal, for these cases, as a rule, are easily handled, but I refer rather to those cases in which there is a thin, serous exudate covering the osseous part of the canal, and where there is scarcely any swelling. The symptom of which the patient complains is not so much pain as intolerable itching, which, at times, must amount to positive torture. This itching may be present without any objective change beyond a slight hyperæmia. There is nothing which has given me such good results in these cases as nitrate of silver. Salves and powders often leave me in the lurch, and time and again I have seen individuals who have been treated by others with the latter remedies, and who still were tortured by the itching. It is in this class of cases I have obtained almost invariable success by filling the canal with a strong solution of nitrate of silver. I usually clean and dry the ear thoroughly, and then instil a solution of nitrate of silver, 60 grains to the ounce, into the canal, filling the latter up to the meatus. I have generally followed the directions laid down by Buck,[2] and not left the fluid in the ear for any fixed period of time. As soon as the patient experiences a burning or throbbing sensation, the ear should be irrigated and the silver solution washed out. I have never found that a solution of this strength ever gave any actual pain, and it not infrequently happens that the solution will remain twenty minutes in the ear without giving rise to discomfort. I have occasionally found it necessary to repeat the application of nitrate of silver, but if the itching returned I should not hesitate to use a solution of 120 grains to the ounce in the same manner. Sixty grains to the ounce, however, is the strength which I generally employ. After this I continue the treatment with an ointment consisting of 5 grains of salicylic acid, 10 drops of carbolic acid, to a half ounce of vaseline. This ointment should be applied to the canal twice daily, and I do not think I have ever seen a case which failed to yield to these measures.

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[1] The Laryngoscope, August, 1902.

[2] A Manual of Diseases of the Ear, p. 95

Malformation of the Auricle. I have called attention in my other reviews to the difficulty we usually have in remedying some of the congenital defects of the auricle, and I can recall several cases of congenital malformation of the auricle where operations by a general surgeon had left the auricle more disfigured than ever. There are some auricles, however, which suggest in their shape the auricles of the lower animals, dogs, for example, and in this class of cases plastic surgery has sometimes been moderately successful. Work in this field, though, is far from satisfactory. Much has been written within the past year on subcutaneous injections of paraffin in deformities, and beautiful results have been reported by Gersuny, Moskowicz, and others. Broockhaert[1] gives his experience in nasal work where the method has been employed in atrophy of the turbinates from ozæna.

Brindel[2] also reports admirable results in restoring turbinates which have atrophied from ozæna.

The most satisfactory work has been done in connection with efforts to remedy the luetic saddle-nose, deformities after resection of the upper jaw, and retraction of the thorax after thoracotomy. Ferdinand Arlt,[3] of Vienna, has employed these injections in malformations of the auricle, and with gratifying results. He recommends the method especially in that variety of malformations where the auricle hangs over like a dog's ear. He makes repeated injections of a few cubic millimetres of the paraffin into the anterior surface of the ear muscle. The injections are repeated once a week. The objective reaction after the injection is quite marked, but it disappears in a few days, and there is no pain to speak of. The paraffin is first sterilized by melting, and is then drawn up into a hypodermic syringe and is cooled by putting the syringe in water, and it should only be injected when it can be forced out of the needle as a fine thread, in other words, it must be cooled off before using. One must be careful to inject very little at a time into such tissues as the auricle. It soon hardens after injection, and the flabby muscle gradually stiffens up. Alt's large experience as an assistant in the clinics of Politzer and Gruber enables him to speak with authority, and it is a suggestion which I shall certainly try in this class of cases, in which present methods of surgical interference give anything but satisfaction.

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[1] Annales des maladies de l'oreille, du larynx, etc., June, 1902.

[2] Rev. heb. de laryngol., d'otologie, etc., June, 21, 1902.

[3] Monatschrift f. Ohrenheilk., September, 1901.

MIDDLE EAR.

Chronic Middle-ear Catarrh. Every year I have called attention in my review to new methods which have been suggested for the treatment of this affection, and have made it a point in my own practice to give them a trial, but as yet I have failed to find the agent which can be truly said to be pre-eminently useful. I believe that catheterization is the most valuable of the mechanical methods. It is the method with which we can least well dispense, yet there are those who have absolutely discarded catheterization and regard it as harmful. I have several times alluded to the inadequacy of surgical methods, to say nothing of internal medication, and yet I have seen some cases distinctly benefited by *thiosinamin* in half-grain doses three times a day. Since hearing a paper by Suker on the use of this agent in treating corneal opacities, I have been using it in larger doses. My experience has been that in doses larger than the ones which I have mentioned it produces distressing vertigo. I must confess, however, that I have not persisted in its use when the vertigo appeared, and have seldom given doses of over 2 grains three times daily. I have been especially struck with its value in tinnitus aurium, which I have seen permanently disappear. Beck and Suker[1] have recently published observations which confirm those of my own, made several years ago, that in a certain number of cases much benefit follows the administration of this drug. Suker has found the agent most useful in those cases where we have an exudate which has remained unabsorbed, also in cases in which the drum membrane has been ruptured and restoration has taken place by cicatricial tissue which interferes with the minute vibrations of the drum. In such cases the cicatrix can be materially thinned out by the administration of thiosinamin, while thickening of the drum membrane may be much reduced by its prolonged use. There is an increase in the number of white blood corpuscles during treatment with thiosinamin, and this condition keeps up as long as the drug is taken. It seems to be absolutely harmless, and can be given in almost any dose to either old or young, provided that there is no latent focus of inflammatory reaction in the individual, for such a focus is apt to be fanned into activity by thiosinamin. This, then, is the only contraindication to the use of the drug. According to Suker, the presence of latent tuberculosis in either joint or lung would constitute a decided objection to giving a large dose of thiosinamin at the start, and hence he advises in such cases ½-grain doses at first and gradually increase. I should say, as I have mentioned elsewhere, that my results have usually been obtained with the small doses, and I have made it a rule to start my patient on ½-grain doses, three times daily, and have stopped at 3 grains at a dose. Beck advises the use of electrolysis along with thiosinamin. My experience has been pretty much like Suker's, and the only noteworthy difference is that he has been in the habit of giving his patients much larger doses. Fischenich has recently suggested the intratubal injections of a 2 per cent. aqueous solution of *pilocarpine.* I have not tried the method, but his report has an encouraging sound. I have again and again spoken of the various methods of massage, but it strikes me that I have found no substantial improvement upon the Siegle pneumatic speculum attached to a Politzer bag. Hominel has suggested a very simple method of massage, which consists in pressing or pushing the tragus back into the external auditory canal, and in this way we get a condensation of the air in the canal. The pressure should be made rapidly, say about one hundred and twenty times in a minute, and should be repeated from four to six times a day, and should not be kept up longer than a minute and a half. We know, of course, that it is impossible to obtain in this way complete closure of the canal of the meatus, and while there may be some movement of the drum membrane this movement must necessarily be slight. The simplicity of the method recommends it. It is possible that our failures are attributable to the feebleness of the mechanical action produced. Sclerosis of the middle-ear mucous membrane is nothing more nor less than a sort of cicatricial shrinking or contraction which may be either primary or may result from chronic hyperplastic catarrh. Very often we have in addition a deposit of lime salts which only make the mucous membrane more rigid and hard. If we can in any way soften or make this membrane more supple we can help the movements of the ossicles.

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[1] The Laryngoscope, October, 1902.

PNEUMATIC CABINET. According to Hamm,[1] the softening of the membrane can be obtained by making the pressure stronger, at the same time by lengthening the duration of this pressure. The sudden rise and fall of pressure which we produce with most of our methods of massage often give rise to pain; in other words, the transition from one to the other is too quick. The pressure should rise slowly and sink slowly. He has used for this purpose the pneumatic cabinet, in which the patient takes a seat and is exposed to the required conditions. In my review for 1899,[1] I mentioned the satisfactory results which Hovent, of Brussels, had obtained with this method of treatment. As practised by Hamm, the treatment covers about forty sittings, and it is given every day, the patient being exposed to the pressure of one atmosphere. He reports eight cases, in all of which there was some improvement in the hearing, but this improvement only persisted in three of the cases. All of the cases had been treated for a long time by the usual methods and were getting steadily worse, when the pneumatic cabinet treatment was instituted. Each sitting lasts for one hour, and during the first twenty-five minutes of this time the pressure is going slowly up, and the rest of the time the pressure is allowed to subside slowly. It is evident from Hamm's report that failures are often to be encountered, but it seems to me that we should at least try the pneumatic cabinet in the many cases in which our usual remedies have utterly failed to do good. I may say that the method has also been employed by Liebig, Freud, and others, and with encouraging success.

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[1] Münchener med. Wochenschrift, February 5, 1902.

TREATMENT WITH OZONE. Four cases are reported by G. Stoker.[2] The ozone was generated by an electric current acting in a Ruhmkoff's coil, to which an ozonizing tube was attached. The ozone generated in this way was pumped through an Eustachian catheter for three minutes from twice to four times a week. In all the cases hearing was improved, and the tinnitus markedly so.

TINNITUS. In my annual review I have seldom failed to say a few words with regard to the treatment of this most troublesome symptom of middle-ear disease. · The great frequency of this symptom is familiar to us all, and if one reads extensively otological literature, one must be impressed with the obstinancy with which the battle is waged against this condition, as evidenced by the multitude of remedial measures which come to light every year. These measures die young, and in the treatment of tinnitus we are still, for the most part, seeing through a glass darkly. The most recent suggestion comes from Belgium in the shape of a communication from Drs. Bayer and Penninckx.[3] These observers have treated a number of cases of tinnitus aurium with static electricity. The method consists in applying the blunt point of the metallic conductor to within about 1 or 2 centimetres of the tympanic membrane. They give minute directions how to avoid producing sparks, which can cause disagreeable and even painful symptoms; but these sparks, he maintains, can be helpful in certain forms of sclerosis of the middle ear where there is atrophy of the tissues, for in such cases the resulting hyperæmia is really beneficial. The first application should last three minutes, going up gradually to the maximum amount, which is fifteen minutes. The number of times varied from fifteen to thirty, and sometimes even more. In cases where the subjective noises were associated with vertigo the latter symptom disappeared first, and in a number of cases a decided amelioration in the deafness was noted. They analyze in detail seven cases. None of the cases could be regarded as belonging to the neurasthenic or hysterical type, and all of them had been subjected to other treatment without avail. The authors very frankly attribute much importance to the treatment of nasopharyngeal troubles, and also in keeping the tubes open, in other words, static electricity is not everything. They have never seen any harm come from the employment of the method. I am unable to speak authoritatively in the matter, as I have never tried the treatment, but I am much disposed to countenance a trial of any measure which promises a possibility of relief and which at the same time is apparently free of harm.

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[1] PROGRESSIVE MEDICINE, March, 1900.

[2] Lancet, November 1, 1902.

[3] Rev. heb. de laryngol., d'otologie, etc., 1902, No. 34.

RADICAL TREATMENT. At a meeting last winter of the Otological Section of the New York Academy of Medicine, Bates[1] presented a paper on the radical cure of this class of cases. I have never tried the method; indeed, so far as I know, the operation thus far has been employed by the originator alone. The cases which were helped had better bone conduction than air conduction for all the Hartmann series of tuning-forks, and the operation was only performed after the well-known methods had failed to benefit the hearing. The object of the operation was to obtain room for the local treatment of the region of the oval window and was not to improve the hearing. An opening is made over the mastoid close to the insertion of the auricle. The posterior superior walls of the bony meatus are removed with a chisel until the antrum is exposed. The drum membrane and ossicles are then removed. With the chisel the outer walls of the attic and aditus ad antrum are removed, converting the tympanum, mastoid antrum, and external auditory canal into one cavity, with smooth walls. The skin incision was closed with sutures. The object of the after-treatment was for the removal and prevention of the recurrence of connective tissue from the inner wall of the tympanum. As a rule, the hearing was temporarily made worse after the operation. The treatment usually extended over several months. Twenty cases were reported, and all were benefited, and that, too, to a marked degree. A few who before treatment were unable to hear a watch or an ordinary conversation at two feet were practically cured. In the discussion which followed there was considerable surprise expressed at the boldness of the conception, and I note that there was a disposition to treat the subject rather cavalierly. One point which was brought out in Bates' cases was that the hearing on the non-operated side was improved. According to Dench, this point was first brought out by Wharton Jones. Bates is of the opinion that the operation is necessary in those cases where there is ankylosis of the stapes and where there is fibrous tissue covering the oval window. These conditions, when present, are probably responsible for the deafness, and, no doubt, cases of this kind are rather common. I agree with the views generally expressed, that Bates is working in the right direction; but it is exceedingly doubtful whether we will ever induce our patients to allow such a radical operation so long as we have measures which are in any degree palliative.

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[1] Archives of Otology, vol. xxxi., No. 2, p. 136.

TENSION ANOMALIES. To use Blake's[1] own words, in cases where, as a result of middle-ear catarrh, we have fixation of the sound-transmitting apparatus and the hearing for the voice has become much impaired, and where there are symptoms indicating not only obstructions to the passage of sound in either direction, but evidence that fixation of the sound-transmitting apparatus has reached a degree which exerts an inhibitory effect upon intralabyrinthian transmission (in default of amelioration from treatment), an exploratory tympanotomy may be resorted to for the purpose of determining by tactile and tone test the location and nature of obstructions which could not be detected by means of the latter form of test alone. Blake thinks the risk to the hearing by this operation is the minimum, and it is possible to reach a positive diagnosis not otherwise attainable. Tactile examination may then be made of the mobility of the individual members of the ossicular chain. In such cases an improvement in hearing in the ear not operated upon as well as a general sense of relief from pressure in the head will be experienced. For that variety of tension anomaly known as relaxation of the posterior segments, simple applications of collodion are employed, and Blake is of the opinion that in many cases the normal tension may be restored by this method. The treatment must be repeated at very long intervals, and must be kept up for a long time. In some cases it may be continued for a year or more, application being made once in three or four weeks only in association with Hommell massage. In the more severe cases, where the stretching is considerable, a cone-shaped drum of fine fibres of silk, interlaced with wax as a binding medium, may be employed in the first stage of the treatment. They must remain in position for several weeks until they are gradually

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[1] Archives of Otology, April, 1902.

removed by the normal growth outward of the lining membrane of the canal. In the worst cases of this character, and where the parts can be moved to and fro, the posterior segment may be incised and attached to the descending process of the incus. I should say from the general character of Blake's observations that he is no warm friend of pneumo-massage.

AIR RAREFACTION. Cordes[1] treats these cases by means of air rarefaction in the external auditory canal. For this purpose he has constructed an apparatus, a vacuometer, which is connected with an aspirator. The sitting should last for five minutes, and can, in many cases, be accompanied by catheterization. He advises this method in cases of sclerosis which is not too advanced, also in tinnitus, and where there are sensations of pressure in the head without particular change in the drum membrane. It is also suggested as a means of removing symptoms of vertigo following increased labyrinthian pressure.

ELECTROLYSIS. It will be remembered, perhaps, that from time to time I have spoken of electrolysis in the treatment of this class of cases, and have mentioned particularly the work of Duel. Pierce[2] recently reported twenty-one cases in which this method was employed, and with the following results: In sclerotic affections the electrolysis is useless, and in the great majority of cases of catarrhal disease it has no advantage over other methods of treatment. In a few cases where there is probably a soft exudate near the isthmus it may be regarded as of some value.

TREATMENT WITH BONE-MARROW. Rather a startling communication bearing upon the treatment of chronic aural catarrh comes from Chalmers Watson.[3] Watson's theory is, broadly speaking, that bone-marrow produces an internal secretion of vital importance to the economy, and that this substance is a prophylactic against the action of various bacteria. The use of bone-marrow in the treatment of non-suppurative middle-ear disease is a particular application of this theory. He reports twenty cases in which the treatment was employed. All of these cases had been treated by recognized authorities in the usual manner, and had been given to understand that their condition was hopeless. The bone-marrow preparation he calls myelocene, and it is prepared in the following manner: Fresh bones are selected in which the epiphyses and marrow are perfectly normal. The marrow is extracted with ether, and the ethereal solution is evaporated in the open and then over the warm bath. The fat is then rubbed up with

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[1] Archives of Otology, February, 1902, p. 16.

[2] Ibid., August, 1902.

[3] British Medical Journal, March 22, 1902.

1 per cent. chloroform for preservative purposes. It will be observed that the melting point of the fat obtained in this way varies considerably (from 120° to 70° F.). The fat with the low melting point is the only one which has proved satisfactory. The treatment consists in instilling the drops of the myelocene into the ear every day, and application of the same was made to the skin around the ear, slight massage being employed. The summary of his results is as follows: Of the twenty cases treated four were of a mixed type, the tuning-fork conduction being greater by air than by bone. One case was of post-suppurative origin. Of the fifteen cases of the apparently pure, dry, middle-ear catarrh, eleven showed a record of improvement. Two showed a marked improvement in one ear only, but as this improvement took place in the deafer ear the practical benefit was slight. Two patients, aged forty-six and sixty years, were uninfluenced by the treatment. Of the mixed cases, three showed a practical improvement, and one did not. The post-suppurative case improved. In some cases the improvement has been fully maintained, in others deterioration has set in slowly and has progressed.

MODIFIED MASSAGE WITH LUCAE'S PRESSURE SOUND. I have several times mentioned in these reviews the subject of massage of the tympanic membrane, and have spoken of Lucae's pressure sound. König[1] makes a suggestion in this connection which seems to me reasonable. He dips the little cup on the end of the sound into melted paraffin. One must not let the paraffin get too hard, for its softness is an important point in its favor, as the massage is rendered less painful and can be kept up longer. It produces neither excoriation nor irritation of the tympanic membrane. I have stated elsewhere that the use of the Lucae sound is painful, and patients do not take to the method kindly. When we want to get movement of the entire ossicular chain, Lucae's sound is of some benefit, but I am still of the opinion that when we want to use massage Siegle's otoscope will be found all that is necessary, and in only very exceptional cases will we need to resort to the use of the Lucae pressure sound.

Suppurative Inflammation of the Middle Ear. We frequently meet with communications dealing with the etiology and bacteriology of acute inflammation of the middle ear. Among those bearing upon the bacteriology of middle-ear suppuration the contributions of Leutert, of Königsberg, and Funke, of Philadelphia, are the most notable. I discussed this subject in my last year's review,[2] and I alluded to the works of these observers. Few, however, have approached this subject in the manner in which Kuhnlein[1] has done. Von Tröltsch, Urbantschitsch, Jacobson, and others attribute middle-ear suppuration primarily and principally to some trouble of the nasopharynx, or, to put it in another way, to those troubles which are most apt to produce nasopharyngeal inflammation. Kuhnlein discusses this subject, with reference to the possible bearing of climate upon the etiology of middle-ear suppuration, and he has gone into the subject thoroughly. His conclusions are what we would expect, though it is satisfactory to see these conclusions based upon careful and reliable statistical study. As I say, he found just what we would expect, namely, that in summer, the time when nasopharyngeal troubles are comparatively less frequent, middle-ear inflammation is much less frequent. In connection with this point arises the possible contagiousness of middle-ear inflammation, another point which I have discussed in previous reports. The fact of the matter, no doubt, is that the nasopharyngeal catarrh which we see so often among members of the same family at one time is contagious, in other words, we have the same exciting causes present in members of the same household; hence, the outbreak of several cases of middle-ear inflammation. It may be remembered that Körner has worked along the same lines and with practically the same results. The conclusion of the whole matter is that in taking measures to prevent inflammation of the upper air passages we are taking the best precautions to prevent an outbreak of middle-ear inflammation.

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[1] Rev. heb. de laryngol., d'otologie, etc., March 8, 1902.

[2] PROGRESSIVE MEDICINE, March, 1902.

TREATMENT OF SUPPURATIVE INFLAMMATION OF THE MIDDLE EAR WITH NAPHTHOLATED CRINOLINE GAUZE. Fougeray[2] has been treating his cases of otitis media suppurativa by tamponing the canal with medicated gauze. Some years ago he suggested the method. At that time he had only tried iodoform gauze. After eight years of experience with this method he is convinced of its value. He has tried the various medicated gauzes, such as iodoform gauze, salicylated gauze, phenated gauze, borated gauze, formol, and practically all of the medicated gauzes, and he finds that the naphtholated crinoline gauze is the superior of any and of all of them. He reminds us that this latter variety as met with in commerce is seen in several colors. Sometimes it is white, sometimes yellow, sometimes brown, due to the manner in which the article is prepared. Each variety differs from the other in important details. Fougeray's experience extends over eight years, and during this time he has treated many hundred cases. He suggests that in cases where the external auditory canal is very sensitive, and where there is a tendency to eczema, the white gauze is preferable, as it is less

[1] Monatschrift f. Ohrenheilk., November, 1901.

[2] Rev. heb. de laryngologie, d'otologie, etc., 1902, No. 36.

likely to irritate. Ordinarily, however, the yellow gauze seems to be more antiseptic than the white gauze, and is applicable to the majority of cases. The brown gauze seems to have a slightly stimulating effect, and he suggests the use of this variety in those cases of middle-ear suppuration which he designates as atonic in character. His technique consists in cleaning out the canal, filling it with oxygenated water, and, without allowing the water to run out, to tampon the canal with the gauze. The method is one which I have not yet tried, but it seems reasonable, and, I think, much safer than the old habit of packing the canal with boric acid powder. Bezold[1] is absolutely opposed to tamponing the external auditory canal in these cases.

Soon after Bezold's suggestion—to fill the entire canal with boric acid in treating middle-ear suppuration—it became the habit of many to pack the canal with the powder, actually to ram the powder down into the canal. Several deaths were reported as being due to retention of the pus. I remember at the time having read the clinical histories of these cases, and was far from convinced that packing the canal with the boric acid powder could have been held responsible for the resulting meningitis. Such a thing is, of course, possible, but very remotely so. I have never been in favor of packing the canal, but I see no reason why the entire canal should not be entirely filled so long as the powder is introduced through an insufflator, and the canal filled in this way. I might add that in cases where the perforation is small and located above the equator of the membrane, the latter should be inspected every day, and in this way convince one's self that proper drainage exists. It seems to me that the gauze would be freer of objections on this score than the powder. It would have been well, however, had Fougeray given the histories of some of his cases, or at least have stated whether such treatment were applicable to those cases where the discharge was either profuse or scanty, where the perforation was either large or small. On general principles, a small perforation situated high up calls for the best possible drainage, and it is evident that we do not get this sort of drainage while there is a foreign body in the external auditory canal. I am still of the opinion that such a condition would demand the so-called moist treatment, and that if the gauze were employed the ear should be regularly inspected to see that there is no suggestion of the exudate. Davis[2] is a believer in the so-called dry treatment of suppurative otitis media, that is to say, in the use of the gauze drainage, and he uses this method both in the acute and the dry forms. As Davis points out, it takes a little more skill than powder blowing and syringing. The packing should be done twice daily in acute cases, while in chronic cases once daily is usually sufficient. Davis, however, simply uses sterile gauze, with which he packs the canal after it is thoroughly dried.

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[1] Zeitschrift f. Ohrenheilkunde, Band xli., Heft 3.

[2] New York Medical Journal, July 12, 1902.

EARLY INCISION OF THE DRUM MEMBRANE. In my first review[1] I expressed myself very conservatively on the subject of incising the drum membrane in acute otitis media. The past few years have served to change my views entirely. So far as I can see, when properly done, the operation is an innocent one, and I am convinced that much harm has resulted in the past, and, in fact, does at the present time, from not resorting oftener and more promptly to this operation. Just as soon as there is any bulging of the drum membrane, associated with fever and pain, in my opinion it is time lost when spent in efforts to mitigate suffering by means of hot applications. A clean, long cut heals promptly, because the cavity is thoroughly emptied of its infectious contents. Delay means breaking down of the tissue, perforation, and a more or less lengthy siege of otorrhœa. Kōrner,[2] of Rostock, has presented some rather interesting observations upon this point, to which I think worth referring. His statistics show conclusively to my mind that the quicker the incision in the drum membrane the quicker the healing. For example, cases operated on the first day healed in seven days ; cases operated on the second day healed in nine days; cases operated on the third day healed in fourteen days; cases operated on the fourth day healed in fifteen days: cases operated on the fifth day healed in sixteen days; cases operated on the sixth day healed in twenty-four days; cases operated on the seventh day healed on the twenty-sixth day.

That the prompt opening of the drum membrane is the best safeguard against mastoid complications is evidenced by these statements. Of ninety cases of mastoiditis operated on in a given time, in only fourteen was there a history of having had the tympanic membrane incised, and of these fourteen only four had been incised on the first or second day, in other words, in ten of the fourteen incision of the membrane had been delayed. In an unbroken series of mastoid cases which were operated upon only forty-three had a history of having had an incision of the tympanic membrane, and in the same space of time incisions in the drum membrane were made in twelve hundred cases in the same clinic.

PERIODICITY IN THE DISCHARGE FROM THE MIDDLE EAR. No doubt we have all, from time to time, seen cases of suppuration of the middle ear which have been running on for years, and in which we have been successful in reducing the discharge to say, apparently, several drops a day. The patient is generally under the impression that the ear is completely cured, but a careful examination will frequently reveal moisture, and two or three drops of an exudate may be brought away. And to get rid of these two or three drops, which seem to be all which collect in twenty-four hours, often takes more time than all our previous treatment. In fact, it is the tail-end (so to speak) of these cases which worries us. I recall having seen such obstinate conditions more than once in women. Such cases sometimes present a periodicity as regards the discharge. There is a time when the ear is actually free of the discharge, and the exudate is poured out between certain hours. Such a patient on leaving the office in the morning will do so with an absolutely dry ear, and inspection that night will show a similar condition; but on seeing her the next morning there will be found the inevitable exudate. In this connection Urbantschitsch[1] reports the following case which is interesting enough to record in detail. The patient was a man, aged forty-eight years, who for twenty-five years had suffered off and on with attacks of middle-ear suppuration. Under treatment Urbantschitsch managed to reduce the secretion to a very minute quantity, and he noticed that this secretion only showed itself between ten and twelve o'clock, and appeared to come to a standstill after about three o'clock. It would be wiped dry, but there was always some accumulation up to about this time in the afternoon, while later the ear remained dry until between the same hours the next day. Urbantschitsch tried inhalations of nitrite of amyl (two or three drops on a piece of cotton). This inhalation was kept up until there was slight redness noticed in the temporal region. The next day the secretion started an hour later, kept up for three hours, but it was manifestly much feebler. An inhalation was given the next day, and it was observed that after each inhalation the exudate was less. After the fourth inhalation the ear remained dry. Before the commencement of the treatment the patient had complained of much heaviness about the head just before the time when the secretion showed itself. This symptom disappeared entirely. Urbantschitsch thinks that the condition was evidently a trophoneurosis, inasmuch as it was so favorably influenced by the nitrite of amyl. Another case equally interesting is recorded. This patient, however, was affected with a profuse otorrhœa, accompanied with considerable pain. The case had been under treatment for weeks, with no benefit. It was noticed, however, that the exudate commenced to make its appearance generally about nine o'clock and stopped at midday. In the afternoon he convinced himself that there was not the slightest accumulation of pus. In three days the inhalation of nitrite of amyl causes complete disappearance of the discharge and of the pain over the mastoid, which latter had been a very prominent symptom. The secretion in both cases had been of a mucopurulent character.

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[1] PROGRESSIVE MEDICINE, March, 1899.

[2] Archiv f. Ohrenheilkunde, i. u., Band lvi., Heft 2.

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[1] Rev. heb. laryngol., d'otol., etc., July 12, 1902.

PYOKTANIN. Some years ago I had occasion to use pyoktanin in the treatment of suppuration of the middle ear. I made no report of my results, but I was not impressed with the efficacy of this product. Its antiseptic properties are well known, and it does not seem to be in the least degree irritating, but it did not strike me at that time as an agent which was comparable to either boric acid or to some of the other remedies which we commonly use in treating suppuration of the middle ear. Not long ago Dr. Gautier[1] instituted experiments with another of the same group of agents, methylene blue. He employed the blue principally in the case of children who were suffering with a chronic suppuration of the middle ear characterized by a great deal of odor. Nine children were treated, and among these seven were completely cured by the daily application of the methylene blue, kept up for three or four weeks. One of the children was lost sight of, and the remaining one had mastoid complication. This is the manner in which the blue is employed: The external auditory canal is first washed out, and then there are instilled fifteen or twenty drops of a lukewarm solution of a 1:500 methylene blue. This is allowed to remain in the ear for five minutes, during which time it is well to have the patient try the Valsalva method, which facilitates the penetration by the methylene blue of the tympanic cavity. The penetrating properties of the aniline dyes are well known, and I have no doubt that both methylene blue and pyoktanin can be regarded of some value in the treatment of suppuration of the middle ear, particularly where there is much odor. One of the chief objections to the use of these agents is the difficulty of avoiding staining the face and parts adjacent to the ear. I remember in the case of pyoktanin several individuals who refused positively to have a second application on account of the disfiguring stain produced by the first instillation, which was somewhat troublesome to remove at once.

MICROSCOPIC EXAMINATION OF THE DISCHARGE. Snydacker[2] has recently brought forward some interesting facts showing that we can derive much useful information from the microscopic examination of the discharge in these cases, that is to say, in the chronic ones. I have long thought that a systematic examination of this character might throw light upon the extent of the disease, but I have never undertaken to test the question, and so far as I know Snydacker's communication is the first on the subject. The author makes it a rule to examine the sediment of the washings from the middle ear in all cases where the discharge has lasted for a year and over. The presence of epidermis in the washings after rational treatment has been persisted in for a reasonable length of time is always a symptom to be seriously considered. We may suspect cholesteatoma. Another finding which must be considered of the greatest importance, irrespective of the clinical aspect of the case, is the continued presence of bone dust in the sediment, and I am quite in accord with Snydacker in thinking that either of these findings rates much higher in importance than a bacteriological finding.

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[1] Echo méd. du Nord., No. 41.

[2] Archives of Otology, vol. xxx., No. 4.

It may be interesting to describe his method of making the examination. Portions of the washings which seem to contain the most sediment were first centrifuged and a drop of the sediment was first examined without staining. To another portion of the sediment was added a drop of picrocarmine, and this was examined under the microscope. For detecting bone in the sediment some of the latter was placed on a slide with albumin fixative stained with hæmatoxylin and eosin dehydrated with alcohol and mounted in Canada balsam.

SYPHILIS THE CAUSE OF SUPPURATION OF THE MIDDLE EAR. While on this subject I am reminded of an interesting communication by Parmentier,[1] who reports a case of otitis media suppurativa in which lues was supposed to have been the cause. The case is such an unusual one that I think it worth narrating in detail. The patient had been suffering with an otorrhœa for six months, and when examined was found to have a large polyp which sprung from a perforation located at the superior and posterior portion of the tympanic membrane. She had numerous patches over the vault of the pharynx, and these closely resembled mucous patches, and, although it was impossible to get a history of lues from either the husband or herself, there seemed, nevertheless, good reasons for believing that the patient was luetic, inasmuch as she had a characteristic alopecia, and there was both cervical and inguinal adenitis. She refused to have the polyp removed, and Parmentier put her on antiluetic treatment. She was lost sight of for two months, at the end of which time she returned. The discharge had entirely stopped and the polyp had disappeared, and in its place was found a beautiful cicatrix of the tympanic membrane. All this time the patient had faithfully carried on the treatment. Parmentier regards the aural trouble as distinctly one of syphilitic origin, and places it in the category with iritis, dacryocystitis and nephritis of syphilitic origin, basing his opinion chiefly upon the fact that the throat trouble showed itself for only five weeks, while the otitis had appeared unexpectedly five months previously, and finally upon the remarkable efficacy of the antiluetic treatment.

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[1] Progrès médical Belge, February 15, 1902.

Tuberculous Otitis Media. I have several times alluded in my reviews to tuberculous otitis media and its peculiar features, and in this connection I would refer to a very recent work by C. K. Grimmer.[1] The author discusses very fully the clinical aspect of the condition, and then proceeds to give an account of his inoculation experiments. The tissues for examination were taken from the areas most actively involved, and they consisted of granulations and scrapings of bone. These were pounded in a mortar with sterile normal salt solution, and the more liquid portion was injected into the peritoneal cavity of a guinea-pig. He concludes his valuable communication as follows : Advanced tuberculous changes may be present in the mucous membrane of the tympanum and of the tympanic membrane itself without producing visible evidences through the external auditory canal. It is interesting to learn the reason for multiple perforations frequently seen in this class of cases. This Grimmer thinks is due to the marked resistance which the membrana propria of the tympanic membrane offers to tuberculous infiltration. This membrana propria is only destroyed by erosion. Latent tuberculous nasopharyngeal adenoids and all other latent foci must be excluded before deciding that any case of middle-ear tuberculosis is a primary affection. Probably from 65 per cent. to 70 per cent. of cases of suppurative otitis media in children under five years of age are tuberculous, while in adults not more than 16 per cent. are tuberculous. Intraperitoneal injection of guinea-pigs is a reliable method of proving the presence or the absence of tuberculosis in the granulations from the middle ear. Reliable proofs may also be obtained by examining these granulations under the microscope or even an enlarged mastoid gland and nasopharyngeal adenoids when present. In cases of suppurative otitis media the absence of ear pain early and extensive destruction of bone, early facial paralysis, multiple perforations, pale, flabby granulations with caseous points in the meatus about a mastoid sinus and in the mastoid antrum, and an enlarged mastoid gland point strongly to the disease being tuberculous. The detection of bare bone with a probe through the meatus, the character of the discharge, facial paralysis and extensive destruction of bone appearing as a late symptom are of doubtful value in arriving at a diagnosis, while the presence of cholesteatomatous masses is positively opposed to tubercles being present.

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[1] Archives of Otology, June, 1902.

Closing Old Perforations. As a result of either an acute or chronic suppuration of the middle ear we often have a hole in the tympanic membrane. The defect persists, and in addition to possibly rendering the middle-ear cavity more liable to reinfection its very presence impairs hearing. The smaller perforations in the drum membrane can frequently be closed by touching the edges with a little nitrate of silver fused on the end of a probe or with a crystal of trichloracetic acid as practised by Gomperz, Okuneff, and others, and which I myself have employed with good results. Three years ago I[1] stated that I had used trichloracetic acid a number of times as a means of closing old perforations in the drum membrane. During the past three years I have felt no reason to feel disappointed in the method. Gomperz[2] regards it as by far the most valuable method we have for treating old perforations. The method of applying the acid is very simple, and though slightly painful seems free of danger. I usually wrap a small piece of cotton tight around the end of a sound, and the latter is dipped into the acid and carried into the canal. The edges of the perforation are then touched with the acid. Of course, the middle ear should be anæsthetized before the application is made. The cauterizations, according to Gomperz, are indicated in all kinds of perforations. Neither the size of the perforation nor the age of the patient is an obstacle. Gomperz makes the statement that he has often seen large perforations in patients over fifty years of age close up promptly, while very small holes sometimes do not close. The treatment is rather long, for the cauterizations can only be made at intervals of six or eight days. It is not wise to cauterize any oftener. Gomperz obtained cicatrization in more than half of his cases. It is true that I have tried the agent in only a few cases (I think only five) ; but I obtained closure in every case. It will be noticed that the deafness is sometimes markedly improved, and that the subjective noises frequently disappear entirely.

Artificial Drums. Sometimes the larger perforations resist all our efforts to close them, and in such cases artificial drums often prove useful, not only by adding materially to the hearing but serving as a protection to the middle-ear cavity. I must confess, however, to a lack of faith in the artificial drums which we see on the market, and I have more than once seen harm come from their use. The most satisfactory thing of this kind is a tampon or cone with its base a little larger than the opening in the drum membrane, and with the apex of the cone reaching outward as far as the commencement of the cartilaginous portion of the canal. While this kind of an artificial drum often does no good, I have never seen it do harm. One can, of course, make such a tampon in a minute. The idea is an old one. In this connection, Bentzen[1] has been making some interesting experiments in Schmiegelow's clinic in Copenhagen. He uses a tampon made of cotton, which is introduced with a delicate pair of forceps. Sometimes the artificial drum is shaped like a ball and is introduced into the ear on the end of a delicate piece of wire. In this shape the patient can introduce it and remove it at will. The point upon which Bentzen lays particular stress is the location of the tampon or ball. It should be pressed right up against the round window, and in this position much better results have been obtained. According to Lucae[2] the artificial drum does not act by increasing intralabyrinthian pressure, for, in this case to get the desired effect it should always be placed upon one of the two windows, but he has been able to get the same effect by pressing it against the upper portion of the promontory. His theory is that it prevents the sound waves from passing by the osseous wall of the labyrinth. It acts then as an obstacle, or, rather, it interferes with the further passage of the sound waves, and the latter are reflected. Normally, this kind of inhibition, so to speak, would be performed by the drum membrane under the influence of the tensor tympani.

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[1] PROGRESSIVE MEDICINE, March, 1900.

[2] Annales des maladies de l'oreille, du larynx, etc., October, 1902.

Gomperz[3] has observed in most of the cases where the perforation takes up less than a quarter of the membrane, and in cases where the continuity of the ossicular chain is preserved, that the artificial drum rarely does any good, but in cases where the patients complain of buzzing in the ear and of a feeling of heaviness in the head, symptoms which frequently exist as a result of the perforation, in such cases he has found that the artificial drum relieves in the most marked manner.

Gomperz[4] has been in the habit of employing an artificial drum, made of pure silver, which is moulded into the proper shape, that is to say, with a convolution in it corresponding to the location of the perforation. He has found silver foil very useful for this purpose. With such a drum membrane he has been able to get by far the best functional results, and the patients have been able to wear such a membrane for weeks without the slightest evidence of irritation. They are generally removed by syringing out the canal.

Of course, when both fenestræ are obliterated and the patient is perfectly deaf, artificial drums will do no good. An ear drum of cotton is about the only substitute for the tympanic membrane which I have ever employed. I usually flatten out the large end of the cone and twist the stem so that the whole thing looks like a little mushroom. The fact that it is harmless speaks strongly in favor of this kind of a substitute for the drum. I am opposed to the addition of the fine wire as suggested by Bentzen and others, as I have seen harm come from the use of artificial drums with metallic attachments. Bentzen holds the little tampon or ball in boiling water a few minutes before introducing it. This I think a good suggestion, first, because the tampon is sterilized, and second, because it can be more easily introduced as a whole, and can be made to assume the proper shape after it has been applied to the promontory and stapes. I have generally used a little glycerin, but there are obvious advantages which the boiling water has over this. It is interesting to note the functional results which were obtained by Bentzen. Exhaustive subjective tests were always made before the artificial drum was introduced. He reports a number of cases, and he finds that the hearing is markedly improved for whispered words. With the tuning-fork there was no change for the upper tone limit, but some lowering of the lower tone limit. There was an increase in the quantitative hearing power, and there was no marked change in bone conduction. The conclusion which I draw from these observations is that in not a few cases decided comfort will follow the use of such an artificial drum and that the method should always be tried.

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[1] Monatschrift f. Ohrenheilk., January, 1902.

[2] Archiv f. Ohrenheilk., Band liv., Heft 3 u. 4.

[3] Annales des maladies de l'oreille, du larynx, etc., October, 1902.

[4] Monatschrift f. Ohrenheilkunde, October, 1902.

THE LABYRINTH.

Syphilitic Disease of the Labyrinth. With the exception of those cases of local deafness following epidemic cerebro-spinal meningitis, scarlet fever, and typhoid fever, and in which there can be very little doubt that the chief lesions are located in the labyrinth, we are often at sea when it comes to establishing the presence of a labyrinthian affection. It is a well-known fact that when subjective tests have declared positively in favor of labyrinthian disease, careful anatomical examination failed to reveal lesions outside of the middle ear. The exact pathological lesions in what is known as syphilis of the labyrinth are not yet clearly established, and its symptoms are often indistinguishable from those of advanced chronic aural catarrh. Cases, though, of pronounced deafness, particularly when associated with dizziness, should not be too promptly diagnosed as instances of that very common affection, chronic aural catarrh, but they should be studied with a view to the possibility that we are dealing with lues of the labyrinth. At least, this class of cases suggest the need of closer questioning with reference to syphilitic infection. I do not, of course, refer to the inherited syphilis, but to the acquired form, in which the ear affection is seen in either the closing scene of the secondary stage or at the commencement of the tertiary stage. As I have said, the symptoms are often indistinguishable from those of chronic aural catarrh; but, roughly speaking, if we are unable to explain the deafness in any other way, we may suspect syphilis, especially when the subjects are young adults who have rapidly grown deaf. I have been impressed with the frequency of labyrinthian disease since reading a communication of Eugène Félix.[1] Félix has been making some very systematic examinations of the patients treated in the ear clinic in Bucharest, and he finds that 37 per cent. of those treated in the clinic during the seven months in which he was conducting his examinations had labyrinthian disease. We are prompt enough when we are confronted with iritis to suspect syphilis, and frequently our suspicions are confirmed. It might be well for us to apply the same rule to our cases of supposed middle-ear trouble, and try the effect of the iodides and mercurials, instead of wasting time on our usual methods. The communication of Félix at least suggests that we are often treating cases of supposed chronic aural catarrh with our routine methods when we are really dealing with either a commencing or an advanced labyrinthian disease of syphilitic origin, and in the treatment of which much valuable time is being lost in withholding the mercurials and iodides.

Labyrinthian Trouble Caused by Salicylate of Soda. It is astonishing how seldom we meet with labyrinthian complications as a result of using large doses of either quinine or salicylate of soda. We know that both of these drugs produce congestion of the labyrinth, and yet, in our cases of iritis and articular rheumatism, enormous doses of salicylate of soda are given, and we are equally familiar with the generally free use of quinine in the malarial belt. It is no uncommon experience to have patients tell us of the intense buzzing and fulness of the head which are experienced after taking either of these drugs, and yet we seldom hear of a serious aural complication. I am speaking now of individuals who have supposedly normal ears, and have repeatedly remarked upon the danger of administering either of these drugs where there is an inflammation of the middle ear. Quinine especially is an enemy when middle-ear suppuration is present. Reports now and then do come in which show that serious labyrinthian troubles may be produced in a previously healthy ear by the ingestion of large doses of these drugs. Such cases have been reported by Gradenigo, Moos, and others, and they teach us at least to be careful and not to treat lightly the distressing subjective noises which are so frequently produced when we are treating iritis and rheumatism in the prescribed manner. I am prompted to make this suggestion by a case recently reported by Scheyr.[1] The case was that of a woman, aged thirty-six years, who had articular rheumatism and who was taking for five days consecutively five powders daily, each powder containing 5 centigrammes of salicylate of soda. On the sixth day she was taken with a very intense headache, vertigo, and tinnitus in both ears. The salicylate was at once stopped, and the tinnitus ceased in the right ear, but persisted in the left ear. The vertigo was persistent. The tympanic membrane showed nothing abnormal. The osseous conduction on the left side was completely abolished. Whispered words were lost, so also were ordinary tones of the voice. Catheterization produced no improvement, nor, in fact, did any other treatment. When last seen the patient could hear the whisper on the right side at 2½ metres, and on the left side at 1½ metres. Whenever the patient moved around the vertigo became intense. The only other symptom which seemed less pronounced was the tinnitus. Such results are happily rare, but they teach us practical lessons.

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[1] Annales des maladies de l'oreille, du larynx, etc., December, 1901.

THE MASTOID.

Disease of the Mastoid Confused with Brain Tumor. I have had my attention called more than once to the great difficulty of making a diagnosis of cerebral abscess, and have seen several heads opened, with the expectation strong in the mind of the operator that a collection of pus would be found in a certain locality, and where the symptoms pointed with certainty to the site of the lesion, and yet the operation brought to light no abscess. This has not been the case, however, when the supposed abscess was of otitic origin, but that it does happen now and then, even in the latter class of cases, has been shown by reports from Massier,[2] Broca, Laurens,[3] and others.

The case reported by Broca and Laurens is especially interesting, as several distinguished surgeons and neurologists had consulted and had pronounced the condition one of cerebral abscess. There were frequent chills, paresis of one arm, occasional loss of memory, hesitation in speaking, sometimes slight aphasia, periods of marked hebetude, and with these symptoms was associated visual disturbances. The case reported by Massier is almost as striking. Here there was also an otorrhœa, violent headache, cutaneous hyperæsthesia, fever, and complete paralysis of the left arm. The patient was unable either to turn himself in the bed, to take hold of anything, or to move the feet. The extremities were rather cold. A number of surgeons made the diagnosis of abscess of the brain, and gave a bad prognosis. The radical operation upon the mastoid in both cases revealed the source of the trouble and resulted in a complete disappearance of the symptoms. The condition present in these two cases was due not to a collection of pus but to a meningitis consecutive to the otitis, and as Broca and Laurens have stated, it was a variety of meningitis which in its symptoms closely resembles those of abscess of the brain. It would seem, then, that in the presence of cerebral symptoms with a chronic otorrhœa, a thorough opening of the mastoid antrum and of the tympanic cavity would be indicated, for such a procedure can hardly be anything but beneficial. If we do not find pus we would have cleaned out an infected area situated very close to the brain. In these cases where it is strongly suggestive that the changes in the mastoid and tympanic cavity are limited it is hardly necessary to make an exploratory cerebral puncture.

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[1] Rev. heb. de laryng., d'otol., etc., July 12, 1902.

[2] Ibid., June 28, 1902.

[3] Annales des maladies de l'oreille, du larynx, etc., January, 1902.

Treatment of the Early Stage of Mastoiditis. As regards the most recent suggestions for the treatment of mastoiditis, particularly of the early stages, I am reminded of a discussion on the subject at the last meeting of the American Laryngological, Rhinological, and Otological Society, in May, 1902. It seemed to be pretty generally the rule among those who participated in the discussion to practice inflation in the early stages of mastoiditis. I can understand how this step will restore, as it were, the balance of the drum membrane; but I have more than once seen harm come from inflation under these conditions. It is possible to drive infectious material right up into the tympanic cavity, and I have found that the inflation of an inflamed tympanum is more or less painful unless performed with the catheter. I am of the opinion that when the inflation is performed the catheter should be employed in preference to the Politzer bag. I am opposed to the inflation of the tympanic cavity where there is a history of la grippe, and I quite agree with Goldstein,[1] of St. Louis, who says: under no circumstances is either Politzerization or catheterization indicated in any stages of this affection. Several members spoke in favor of oily mixtures when instillations were necessary to quiet pain. I am disposed to think with Dench, that these mixtures may do harm by furnishing an excellent nidus for the development of the aspergillus. It was the general opinion that early incision of the drum membrane should be performed in these cases, and most of the members favored cold as an application. I cannot agree with Richardson in thinking that cold should be left on as long as improvement is observed. The good that cold does is done quickly, and if the inflammatory process is not promptly aborted it is more than probable that the symptoms are being masked.

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[1] The Laryngoscope, March, 1902.

I have in mind two cases where there was relief of both subjective and objective symptoms after using the ice-bag for three days. Both patients (women) got up and left the hospital, and in less than a week it was found necessary to open the mastoid in both cases. I usually allow the ice-bag to remain on for thirty-six hours only, for longer than this the symptoms might be masked.

IRRIGATION AFTER INCISION OF THE DRUM MEMBRANE. The question of irrigating immediately after incising the drum membrane was brought up, and there was some diversity of opinion. I agree with those who omit the irrigation immediately after the incision of the membrane. In cases where there has been much pain, and where the latter symptom has disappeared promptly on rupture (either spontaneous or artificial) of the drum membrane, a fresh attack of earache can be set up by the stream of water against the inflamed sensitive membrane. For at least forty-eight hours I have been content to see that the discharge is freely flowing, and have usually introduced a small piece of iodoform gauze into the canal to act as a drain. After the fulminating symptoms have subsided I have commenced with the irrigations.

HOT WATER DOUCHES TO ABORT MASTOIDITIS. Chambers,[1] of Jersey City, advocates the use of the hot water douche as a means of aborting mastoiditis. The temperature of the douche should be 120° F., and the bath thermometer should always be employed to gauge the temperature, and the use of the return current douche is absolutely necessary to avoid blistering from the very hot water. I think that such a measure is valuable, particularly so in cases of acute inflammation of the middle ear, in which disease I have long made it a habit to fill the canal with hot sterile water. I can easily understand how the douche used, as suggested by Chambers, would have a tendency to put a stop to extension into the mastoid. It is very unlikely, however, that the douche would ward off the operation upon the mastoid if pus be present in the cells. It is only in the congestive stage that we can hope for much benefit from hot-water applications. I have been in the habit, as I have said, of filling the canal with hot water and then covering the auricle with warm flannel, which will prevent the water in the canal from cooling off quickly, as it otherwise would certainly do.

Complications of Mastoid Disease. As regards the complications of mastoiditis, no doubt these complications are, as a rule, due to direct destruction of tissue; yet as Seymour Oppenheimer[2] has ably shown many cases of sinus thrombosis, brain abscess and meningitis are directly traceable to infection by way of the small venous channels of the temporal bone.

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[1] Medical Record, August 2, 1902.

[2] Ibid., August 23, 1902.

MISCELLANEOUS.

The Beginnings of Deafness. The habit of making one repeat a question or order is very significant. It is at the theatre that some have discovered that they were deaf, because they were obliged to sit forward in the orchestra. Such individuals will often observe that they hear music much better than they do words. The impossibility of following a general conversation is frequently an evidence of beginning deafness. The vowel *u* is the first of which one loses perception. It will be noticed that individuals who have middle-ear sclerosis will often hear better at the telephone because they are in contact with the receiver. Even the voice can be an index, for, according to Castex,[1] those affected with internal-ear sclerosis generally speak in a high voice, certainly in a much higher voice than do those with middle-ear sclerosis.

Fatigue of the ear is another sign of beginning deafness, that is to say, the hearing power diminishes rapidly, to reappear again after a few moments of silence or rest.

Ear Troubles in Country and City. I have often wondered whether ear troubles were as frequent among country children as among those living in the city. I am familiar with the statistics of Bezold and others on this point. Bezold found that 20 per cent. of the children who attended city schools were affected with ear trouble. It is interesting to know whether this rate is kept up among the children who live in the country, and this information has recently been furnished us by Ostmann,[2] who has made systematic examinations of children who live in the country surrounding Marburg. Among 7537 children, 2142 had defective hearing, that is to say, they heard whispered words at a distance of less than 8 metres. This gives us a percentage of 28.4 per cent. The boys were more often affected than the girls. The largest percentage was furnished by those communities which were largely made up of mechanics, and which were rather remote from the cities. Deafness was found most frequently in the seventh and eighth years, less frequently in the ninth year, and it becomes a little more frequent in the tenth year. The objective symptoms generally consisted in a retraction of the drum membrane.

Surgical Operations upon the Tympanic Cavity. The question often arises, Do surgical operations upon the tympanic cavity ever help the hearing, and should such operations ever be performed? I have discussed this question of operation upon the tympanic cavity in previous reviews, but from other points of view, for example, more particularly as to whether such a measure would relieve chronic suppuration. I speak now, however, of cases where, perhaps, we see the results of suppuration, but where the latter has ceased. In such cases we may have the ossicles bound down and twisted from their course by old exudates which have long organized, and, again, that large class of cases known as *middle-ear sclerosis*, accompanied with tinnitus and vertigo. In this latter variety various operations have been suggested, such as removal of the stapes and puncturing the drum membrane; but I know of no more unsatisfactory operation, either in the performance or in the result, than that for the removal of the stapes. Generally speaking, from the very location of the oval window this ossicle is seen with great difficulty, and even when we get hold of it it usually breaks, and the result of the operation is surely negative. I have never seen a case where the symptoms disappeared from a successfully performed extraction of this bone. The same is true of puncturing of the drum membrane, or the removal of a small piece of it, which has been done for acoustic purposes as well as for tinnitus. Once, and, perhaps, twice, I have seen transient improvement, but as soon as the hole closes the trouble returns. I have repeatedly referred to the tenotomy of the tensor tympani, and have called attention to the frequency of negative results, and, when positive, how very ephemeral. Grunert has suggested the luxation of the malleus handle outward, so that it will assume a horizontal position parallel to the upper wall of the external auditory canal. This operation, however, Gradenigo[1] discountenances. Then, again, we have the forcible movement of the ossicular chain by introducing a hook (after making an incision along the edge of the malleus handle) behind the handle and lifting it up. But it is clear that in those cases where such an operation is theoretically demanded (as for instance where there is ankylosis and fixation from exudates), the attachments would re-form just as soon as the bones were allowed to drop back into place. Far better, employ the various methods of massage which would, to some extent, move the entire ossicular chain. Finally, we have the removal of the entire tympanum and ossicles. I have spoken of this operation elsewhere in speaking of the various treatments of suppuration of the middle ear, and I have expressed myself as being disappointed in its efficacy, and when it comes to relieving deafness and subjective noises the operation, so far as I can learn, yields no better results. Isolated observations tell of immediate improvement, but the subsequent histories of these patients never see the light. Gradenigo[1] is not so pessimistic, and one would gather from his utterances that he had met with not a little success in operating upon the drum cavity for the relief of deafness and subjective noises. He speaks of marked improvement and permanent improvement in hearing in many cases. I have confidence in what Gradenigo says, but it is a pity he has given us no clinical data with reference to his work. He lays, however, great stress upon postoperative treatment in this class of cases. He reminds us that the results are governed largely by the intensity of the operative reaction, that is to say, the more intense the reaction the less definite the result. Consequently we should avoid excessive inroads upon the hearing apparatus, and always operate by way of the external auditory canal in preference to an attack upon the mastoid. As regards this reaction his experience shows that when the tympanic cavity is cleaned out for a condition which originated in a suppurative process the regeneration of the drum membrane was attended with some suppuration, but when the condition originated in a catarrhal process the reaction was insignificant. Very properly he attaches great importance to a close inspection of the regenerating drum membrane, for we know the tendency to the formation of granulation tissue in this location, and this process may lead to rigid adhesions between the promontory and the newly-formed membrane. After the regeneration of the drum membrane is complete he advises massage of the latter with the electric motor, for in this way we increase the capacity of the membrane for vibration. I think, though, that operations upon the drum membrane, such as I have described, and which are performed to relieve subjective noises, will be viewed with skepticism and only resorted to in exceptional cases where hope of relief from all other measures has been abandoned.

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[1] Rev. heb. de laryng., d'otologie, etc., June 14, 1902.

[2] Archiv f. Ohrenheilk., Band liv., Heft 3 u. 4.

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[1] Archiv f. Ohrenheilk., Band liv., Heft 1, 3 S.

It would seem, then, that the most favorable results in operations for removal of the ossicles are obtained in cases of purulent inflammation of the middle ear in which we have a partial destruction of the drum membrane and often of the ossicles; in cases, too, where the otorrhœa has been over for a long time and we find a chronic catarrhal otitis. In this class of cases, also, good results may follow exenteration of the tympanic cavity. In the dry forms of middle-ear inflammation the results are less satisfactory. The postoperative treatment is exceedingly important. In cases where the deafness assumes the character of a labyrinthian disease operative measures are contraindicated because the consecutive reaction would almost certainly make the labyrinthian trouble worse.

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[1] Archiv f. Ohrenheilk., Band liv., Heft 1, 3 S.

Local Anæsthesia. The question of local anæsthesia in otology is such an important one that I have made it a rule to say something about it every year in my review. For the past few years I have been using the solution recommended by Gray, of Glasgow. This solution, it will be remembered, consists of five parts of cocaine, fifty parts of aniline oil, and fifty parts of alcohol. Dupuy reported a case where toxic symptoms appeared after using this mixture, and two other similar observations are on record. The harmful effect is due to the aniline which has been shown to possess very poisonous properties, and for this reason we should never intrust the solution to a patient to use for relief of the earache. I use it for operative purposes exclusively. Haug[1] has gone over the local anæsthesia question thoroughly, and has made a systematic study of the solutions generally used for the purpose of producing anæsthesia in the ear, and he concludes that the mixture suggested by Gray is probably the most satisfactory anæsthetic we possess for operations upon the middle and external ear. Haug has met with local irritative symptoms after its use; but this has never been my experience. He has also employed, with good results, a 2 per cent. solution of *acoin*. He speaks of this latter drug as less toxic than cocaine, and therefore safer. I have used acoin not a little in the eye, and while Haug's statements as to its toxicity are true its anæsthetic properties are inferior to those of cocaine, and it is certainly more irritating than the latter. Orthoform has been suggested, but it must be used in powder form, and it is easy to see that it would be a decided objection to covering the field of operation with a powder which would obscure the view, even though it may lessen the pain. I should be more disposed to blow in a small quantity after the operation, as its effects last for a considerable time. We know that the operation itself is apt to provoke pain which lasts for some time, and inasmuch as the powder is slowly taken up this anæsthetic effect would last for a considerable time after the effect of an anæsthetic solution had passed away. Haug has found that insufflation of the powder was valuable in furunculosis of the external auditory canal. It is clear to me, however, that Gray's solution, which I commended last year from considerable personal experience, holds the first place as a local anæsthetic for operations upon the middle ear, and in this belief we may continue its use. Of course, its toxic effects would be more apt to occur if the drum membrane had a hole in it, and when such is the case the patient should be watched very closely while the mixture is in the ear. A peculiar dark blue color of the cyanosis around the lips and under the finger-nails are the symptoms which have been observed in the few cases on record.

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[1] Archiv f. Ohrenheilk., Band lv., S. 49–53.

I believe, however, that toxic symptoms from absorption through an intact drum membrane may be regarded as a very remote contingency. I would suggest that immediately after the operation the ear should be thoroughly irrigated. It is interesting in connection with the subject of anæsthesia of the middle ear to recall the fact that from recent experiments made on dogs by Reik,[1] of Baltimore, that the faintness which follows operations in this locality is probably not due, certainly not entirely so, to the pressure which is transmitted from the tympanic membrane to the internal car, but that this feeling of depression which we now and then see is due mainly to disturbances of the vasomotor apparatus through irritation of the sensory nerve supply, and, furthermore, that the transmission of such an influence by these nerves is prevented by complete anæsthesia.

The Tendency to Deafness in the Offspring of Tuberculous Parents. We all know the tendency to throat troubles which we find in the offspring of tuberculous parents, and with this in mind it is easy to see how such offspring would be predisposed to ear disease. So far as I know, however, this problem has never been made the subject of any special study, and most of us, I think, have taken it for granted on general principles. Ostmann,[2] of Marburg, has presented us with a rather interesting study in this connection. Six hundred and seventy-six children were examined. These children belonged to three hundred and seventy-five families. In sixty-four families, where there were eighty deaf children, seventy-five were troubled with tuberculosis, and this became 50 per cent. in the families where there were only two or three deaf children, and 25 per cent. where there were no deaf children. This would indicate that among those families which relatively had the greater number of deaf children there was found relatively the greatest number of children affected with tuberculosis. Another interesting fact which was brought out was this, that in families in which all the children were more or less deaf, very often either the father or mother or grandparents had died of tuberculosis; while in families where there were only a few deaf children, tuberculous infection was known to have attacked less often the parents, but rather the uncles and aunts, in other words, the greater the number of deaf children in a family, the more likely it was that the parents would give a tuberculous history. As might be expected, Ostmann finds the reason for these things in the facts which occur to us all, namely, that the children who spring from tuberculous parents have, as a rule, a pronounced sensitiveness of the upper air passages, so that catarrhal conditions often and easily find a place in these localities. Ostmann has noticed in cases where the nasopharynx has been subjected to operations, and where the reactions happened to be peculiarly violent, that a careful inquiry into the history would often elicit the fact that the parents were tainted with tuberculosis. He observed that of the eighty-nine deaf children who sprung from tuberculous parents, twenty-two were pronounced mouth-breathers and proved to have adenoids. When we consider the fact that these catarrhs of the upper air passages prepare or produce a soil suitable for tuberculous infection we can easily understand why ear troubles propagate themselves from generation to generation. From all of this it is clear that children of tuberculous parents are apt to have very delicate and sensitive nasopharyngeal mucous membranes, and in this fact we have the explanation of the existence of ear disease in this class of people. The treatment suggests itself. In addition to the usual local and constitutional treatment the children should be taken away from home and surrounded with better hygienic conditions. The study is an interesting and important one and offers good food for thought to the general practitioners. Children of tuberculous parents should be kept under the closest scrutiny, and when they develop an active nasopharyngeal catarrh they should be removed from the atmosphere of home and kept in pure and healthful surroundings. Chronic nasopharyngeal catarrh in children means, sooner or later, more or less involvement of the hearing.

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[1] Transactions of American Otological Society, 1902.

[2] Archiv f. Ohrenheilk., March, 1902.

Mumps. There was a time when the aural complication of mumps was considered rare, but since our attention has been drawn to the matter more careful inquiry into the histories of our patients elicits the fact that they have had mumps and that this affection is sometimes responsible for the deafness. Toynbee was the first, I think, to call attention to this matter, and since his day the records of cases have been constantly multiplying. It cannot be said, however, that the complication is a frequent one, certainly not frequent when we consider what a frequent disease mumps is. From a study of the various cases on record it will be noticed that in addition to the deafness, subjective noises, vertigo, and nausea are sometimes seen. According to Texier,[1] who has recently made an interesting communication on this subject, the deafness makes its appearance suddenly and is complete. My own observations confirm this statement absolutely. I have yet to see any trace of hearing left after mumps has involved the ear. Lannois makes the statement that the ear can be involved without any glandular lesion on that side. I cannot recall all the cases which I have seen, but I am sure the glandular lesion was always present and possibly more pronounced on the side of the ear which was attacked. I have never seen but one case of bilateral deafness from mumps. Texier says, with regard to this point, that it is just as often bilateral as unilateral. I do not believe that this will be borne out by a study of all the cases on record. Persistent subjective noises are always present. Vertigo is quite common, but its character is different from that seen in Ménière's disease. The latter begins with subjective noises and deafness, and is exaggerated by movement (walking), and it is rarely continuous. Seldom is it accompanied with nausea and vomiting. I do not remember ever to have seen a case of mumps where there were changes in either the tympanic membrane or external ear, and, according to May, deafness from mumps is rarely seen in those whose ears have previously been normal; in other words, the disease shows a preference for the ear which has lost some of its integrity from previous disease. As regards the site of the disease, there seems to be no doubt but that the lesion is situated in the labyrinth, and we have in this region an effusion either hemorrhagic or serous in character. The effect of this effusion is to cause atrophy of the organ of Corti and of the auditory nerve.

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[1] Rev. heb. de laryng., d'otologie, etc., 1902, No. 23.

The treatment of these cases is unsatisfactory in the extreme. More than forty years ago Toynbee recognized the futility of treatment, and it cannot be said that the last four decades have brought forth any measure of relief. He has suggested gentle counter-irritation around the ears, and at the same time the ears are exercised by means of the speaking tube. In the few cases of deafness which I have seen I have put the patient on the iodide of potash with the idea of bringing about the absorption of the exudate which was supposedly present in the labyrinth. Hypodermic injections of pilocarpine have been suggested; but, as I have said, never have I succeeded in getting any improvement in this variety of deafness.

Lumbar Puncture in Otology. At the meeting of the German Naturalists and Physicians a year ago in Hamburg, Schwartze,[1] of Halle, made an interesting communication with reference to the importance of lumbar puncture in otology. He has employed the method for several years in his clinic, and he is impressed with its value. When the puncture results in the outflow of a normal clear liquid we can exclude diffuse purulent meningitis in cases of otitis with intracranial complications. When the fluid, however, is clouded, and is rich in leucocytes, and contains organisms, we may suspect the presence of either a diffuse purulent meningitis or of cerebro-spinal meningitis. When the fluid is slightly opalescent we can say in all probability that we have a case of tuberculous meningitis complicating the otitis. A considerable increase in the cerebro-spinal fluid points to the presence of sinus thrombosis.

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[1] Archives of Otology, vol. xxxi., No. 1, p. 8.

Systematic Examinations of the Ears of School Children. Permowan, Murray, and others have made several communications upon the results of the examinations of the ears of school children, but probably the most exhaustive, certainly the most recent investigation of this character, comes from Cheatle.[1] Cheatle's contribution is valuable as showing, first, the amount of ear disease among the poorest classes, and, secondly, because it draws attention to the subject in the hopes that steps be taken to deal with it. Among other thoughts suggested by Cheatle's report is the necessity of examining all children, whatever their station, at some period, simply to determine whether the ears are sound, and this examination should be made just as soon as they are able to give intelligent answers and can help us in making tests. The startling fact was brought out that out of the one thousand cases three hundred and thirty-five had a history of otorrhœa from either one or both ears, and of these there were eighty-eight cases in which the suppuration was still going on, and seventy-one of these had adenoids. The association of adenoids with ear disease was most marked, for in four hundred and thirty-four cases of adenoids there were three hundred and ninety-four cases of ear disease. The question naturally arises, What should be done. It seems to me that while we are taking such active steps to stamp out eye troubles in the big public schools of this land, steps might easily be taken to ascertain the prevalence of ear disease and to eradicate it. It is useless to leave such matters to the parents, for these, as long as their children are not actually sick or profoundly deaf, are often indifferent to such conditions as adenoids and otorrhœa. The authorities should take the matter in hand and follow out the same scheme as is pursued in the matter of eye examinations—in other words, skilful experts should be appointed and examinations made of the throats and ears of all the children in our public schools. Some of the most trying cases which we meet with in adult life are those in which the ear disease started in childhood, so this latter period is the time to commence treatment. Systems of this kind have recently been put into force in Germany, Switzerland, and Sweden. In the majority of the large German cities physicians have been appointed to the schools to examine especially the eyes and ears, and to see that the treatment was applied when necessary. As Cheatle says, diseases of the ears no doubt cause a much greater loss of life and health than do diseases of the eye.

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[1] Lancet, April 19, 1902.

Diseases of the Ear and Insurance. It is evident that the condition of the ear should play an important part in passing upon the eligibility of an individual to procure insurance. Hammond[1] has given this subject attention. A chronic discharge which baffles all treatment should render an individual an unfavorable subject for the insurance company to accept; on the other hand, a discharge which stops absolutely under treatment may be accepted conditionally, and a suppurating ear which heals by forming a cicatrix may be taken without reservation. On the dangerous list may be included suspicious nodules or tumors of the auricle in elderly persons. Stenosis of the canal due to old traumatisms or abscess is apt to give rise to trouble in cases of an outbreak of middle-ear disease, and the presence of an exostosis is dangerous in the same way. In general those diseases of the ear which should cause the unconditional rejection of an applicant consist of local manifestations of constitutional disorders.

[1] Boston Medical and Surgical Journal, May 15, 1902.

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